Economic Geology
Vol. 64, 1969, pp. 951–965

GEOLOGY LIBRARY
SG GUYOT HALL
PRINCETON UNIVERSITY

INDEX TO VOLUME 64

Absolute age, dates:
interpretation, Sr/Rb, inconsistencies, 342
ore deposits, British Columbia, Rb/Sr, 479
ore deposits, K/Ar, New Mexico, 903
ore deposits. Pb/Pb, India, 677
ore deposits, Pb/Pb, Northwest Territories, 731
ore deposits, Pb/U, Ontario, 691
ore deposits, Utah, Bingham, 228, 229
ore deposits, Utah, East Tintic, 915
Abstracts of papers, Society of Economic Geologists and Society of Mining Engineers, AIME, Washington, D. C., Feb. 17–20, 1969—
Distinguishing the epigenetic from the syngenetic ore deposits (Ridge), 117
Economics, geology, and the search for concealed ore deposits (Peters), 116
Electronic data processing applied to uranium resource prediction and exploration (Bostick), 117
Exploration for minerals and fuels in the northern Bering Sea (Hopkins, Nelson, Tagg, and Wang), 116
Exploration on pediments (Payne), 117
Fracture intersections and domes—exploration guides in southern Arizona (Wertz), 116–117
Geothermometry of ores of the eastern Andes, Bolivia (Kelly and Turneaure), 118
Lateral and vertical alteration mineralization zoning in porphyry copper deposits (Guilbert and Lowell), 118–119
Metamorphic origin of the present Ducktown, Tennessee, ore deposits, The (Salotti), 118
Ore, refolds, and three-dimensions (Brown), 117
Suggested volcanigenic origin for certain gold deposits in the Slate Belt of the North Carolina Piedmont, A (Worthington and Kiff), 118
Abstracts of papers, Society of Economic Geologists, Denver, Feb. 16–19, 1970—
Evaluation of a gypsum deposit (Appleyard), 937
Evaluation of cement raw materials, (Towse), 938
Evaluation of feldspar deposits (Teague), 938
Evaluation of fluorspar deposits (McAnulty), 938
Evaluation of lateritic bauxite and nickel deposits (Dreyer), 937–938
Geologic occurrence and evaluation of bentonite deposits (Wayland), 939
Geology and zonation of the southeast Missouri barite district (Wagner), 938–939
Geology in potash mining and exploration (Adams), 937
Some factors to consider in evaluating talc deposits (Olson), 938
Abstracts of papers, symposium, "A paleoaquifer and its relation to economic mineral deposits," University of Tennessee, Knoxville, Tennessee, March 27–29, 1969—
Appalachian strata-bound deposits: their essential features, genesis and the exploration problem (Hoagland), 351
Bedded-ore structures at the Jefferson City mine, Jefferson City, Tennessee (Fulweiler and McDougal), 348–349
Environment of the zinc deposits of the Mascot-Jefferson City district, Tennessee (McCormick, Evans, Palmer, and Rasnick), 353
Evidence on the age of barite, zinc, and iron mineralization in the lower Paleozoic rocks of east Tennessee (Carpenter, Fagan, and Wedow), 348
Evolution of thought on ore controls in the southern Appalachian Valley (Laurence), 351–352
Fluid inclusion evidence on the environment of formation of mineral deposits of the southern Appalachian Valley (Roedder), 353
Geochemical hypothesis for dolomitization by ground water, A (Hanshaw and Back), 349
Lower Paleozoic paleoaquifer—the Kingsport Formation and Mascot Dolomite of Tennessee, A (Harris), 349
Models of mineralized solution-collapse structures from drilling statistics (Wedow), 353
Ore controls and related sedimentary features at the Flat Gap mine, Treadway, Tennessee (Hill, Morris, and Hagegeorge), 350
Porosity and permeability of Lower Ordovician carbonate rocks in east Tennessee during early Middle Ordovician time (Hill and Wedow), 350–351
Problems on the origin of ore deposits in the Lower Ordovician formations of east Tennessee (Hill, McCormick, and Wedow), 349–350
Regional distribution of mineral deposits beneath the pre-Middle Ordovician unconformity in the southern Appalachian Valley (Maher), 352–353
Tertiary limestone aquifer system in the southeastern United States (LeGrand and Stringfield), 352
Adams, S. S., abstract by, 937
Age and genesis of quartz-porphyry near White Pine, Michigan (discussion), 342–346
Age of some Tertiary igneous rocks from the East Tintic district, Utah (Laughlin, Lovering, and Mauger), 915–918
Ahmad, N., and Jones, R. L., *Occurrence of aluminous lateritic soils (bauxites) in the Bahamas and Cayman Islands,* 804–808
Alaska:
geochemistry, copper, native, trace elements, 455
Ruby Creek, 75
Alberta:
hydrogeology, western Canada basin, 385
Alexandrov, E. A., review by, 120–123, 231–242, 354–361, 469–476, 586–594, 701–707, 940–947
Amer, H. I., with Basta, E. Z., *El-Gidida iron ores and their origin, Bahariya Oases, Western Desert, U. A. R.,* 424–444
Analysis of ore fabric (Chakrabarti), 223–227
Anderson, C. A., *Massive sulfide deposits and volcanism,* 129–146; discussion of paper by, 829
Anhydrite-pegmatite uranium ore at Bancroft, Ontario (Little), 691–693
Appleyard, F. C., abstract by, 937
Application of coal petrography to coking property of Indian coals, The (Pareek), 809–821
Applied geology at the Nickel Mountain mine, Riddle, Oregon (Chace, Cumberlidge, Cameron, and Van Nort), 1–16
Aqua regia extractable copper and zinc in volcanic rocks in relation to copper mineralization (Warren and Delavault), 672–676
Argentina:
bismuth-copper, San Juan province, 271
Arizona:
copper, Christmas, 255
copper, San Manuel, 118
exploration guides, fracture patterns, 116
uranium, exploration, 117
Armbrust, G. A., *Hydrothermal alteration of a breccia pipe deposit, Tribag mine, Batchawana Bay, Ontario,* 551–563
Arnold, R. G., *Pyrrhotite phase relations below 304 ± 6°C at <1 atm total pressure,* 405–419
Arsenic:
abundance, phosphate rock, Florida, 667
Asbestos:
South Africa, general, dolomite association, 936
Asia:
geophysical surveys, seismic, atlas, 693
Associations:
IMA, commission on ore microscopy, 110

Baadsgaard, H., with Chrismas, L., Folinsbee, R. E., Fritz, P., Krouse, H. R., and Sasaki, A., *Rb/Sr, S, and O isotopic analyses indicating source and date of contact metasomatic copper deposits, Craigmont, British Columbia, Canada*, 479–488
Babu, V. R. R. M., *Temperatures of formation of pegmatites of Nellore mica-belt, Andhra Pradesh, India*, 66–71
Bachinski, D. J., *Bond strength and sulfur isotopic fractionation in coexisting sulfides*, 56–65; discussion of paper by, 933; reply to discussion of paper by, 933–934
Bachinski, D. J., with Dasch, E. J., and Petrović, Radomir, books received by, 124–127
Bachinski, D. J., with Petrović, Radomir, books received by, 242–243, 361–363, 477, 595–597, 708
Back, William, with Hanshaw, B. B., abstract by, 349
Bacteria:
  sulfide producing, geochemical prospecting, interference, 832
Bahamas:
  bauxite, 804
Balmat, New York:
  jordanite, occurrence, 932
Bancroft, Ontario:
  uranium, anhydrite ore, 691
Barabas, A. H., with Petrović, Radomir, books received by, 836–840, 947–949
Barite:
  Missouri, southeast, occurrence, 938
  Nevada, Nye County, occurrence, 245
  Tennessee, age, 348
Barsdate, R. J., with Forbes, R. B., *Trace metal zonation in a native copper nugget from the McCarthy district, Alaska*, 455–458
Base metal zoning in the Heath Steele B-1 orebody, New Brunswick, Canada (Lusk), 509–518
Basta, E. Z., and Amer, H. I., *El-Gidida iron ores and their origin, Bahariya Oases, Western Desert, U. A. R.*, 424–444
Batholiths:
  differentiation, Montana, manganese content, 835
Bauxite:
  Georgia, east-central, 834
  ore deposits, general, evaluation, 937
  West Indies, Bahamas, Cayman Islands, 804
Benson mines, New York:
  iron ores, textures, 183
Bentonite:
  ore deposits, general, geology, production, 939
Bergendahl, M. H., with Koschman, A. H., review of book by, 124
Bering Sea:
  marine geology, mineral exploration, 116
Berkeley, Edmund and Dorothy, eds., *Instructions for North American geological investigation: 1756. By Nicholas Crisp*, 569–571
Berner, R. A., *The synthesis of framboidal pyrite*, 383–384
Billings, G. K., Kesler, S. E., and Jackson, S. A., *Relation of zinc-rich formation waters, northern Alberta, to the Pine Point ore deposit*, 385–391
Bingham, Utah:
  mineral zoning, 34
  volcanics, intrusions, correlation, 228, 229
Biogeochemical prospecting:
  uranium, methods, 50
Bird, W. H., *A note on the occurrence of violarite, Copper King mine, Boulder County, Colorado*, 91–94
Bismuth:
  Argentina, San Francisco de los Andes, 271
  Peru, Julcani, mineral zoning, 835
Bisque, R. E., with Pyrih, R. Z., *Determination of trace mercury in soil and rock media*, 825–828
Bolivia:
  geologic thermometry, 118
Bond strength and sulfur isotopic fractionation in coexisting sulfides (Bachinski), 56–65; (discussion), 934–935; (reply to discussion), 936
Bostick, N. H., abstract by, 117
Both, R. A., Rafter, T. A., Solomon, M., and Jensen, M. L., *Sulfur isotopes and zoning of the Zeehan mineral field, Tasmania*, 618–628
Bowie, S. H. U., and Ostle, D., discussion by, 933; reply to discussion by, 933–934
Bowie, S. H. U., *Commission on ore microscopy*, 110–111
Boyle, R. W., discussion by, 112–115, 829
Bray, R. E., *Igneous rocks and hydrothermal alteration at Bingham, Utah*, 34–49
Breccia:
  chemical, ore deposits, 613
  dissolution, Appalachians, Ordovician, 351
  dissolution, interpretation, 351, 352
  dissolution, Tennessee, 349, 350, 353
  intrusive, pipe, Queensland, ore, 885
  intrusive, pipes, Ontario, 551
  Tennessee, east, zinc deposits, 348, 349, 350
  volcanic, pipes, genesis, 832
Brecke, E. A., reply to discussion by, 462–464
Brines:
  Alberta, western Canada basin, composition, 385
British Columbia:
  copper, Phoenix mine, 822
  geochemistry, Craigmont, isotopes, 479
  geochemistry, general, geochemical prospecting, 672
  molybdenum, Hudson Bay Mountains, 833
Brobst, D. A., with Shawe, D. R., and Poole, F. G., *Newly discovered bedded barite deposits in East Northumberland Canyon, Nye County, Nevada*, 245–254
Brooks, E. R., and Garbutt, P. L., discussion by, 342–346
Brooks, R. R., with Cohen, N. E., and Reeves, R. D., *Pathfinders in geochemical prospecting for uranium in New Zealand*, 519–525
Brooks, R. R., with Whitehead, N. E., *A comparative evaluation of scintillometric, geochemical, and biogeochemical methods of prospecting for uranium*, 50–55; discussion of paper by, 933; reply to discussion of paper by, 933–934
Brown, S. P., abstract by, 117
Browne, P. R. L., *Sulfide mineralization in a geothermal drill hole, Taupo Volcanic Zone, New Zealand*, 156–159
Bryner, Leonid, *Ore deposits of the Philippines—an introduction to their geology*, 644–666
Bubenicek, L. A., discussion by, 341
Buchanan, A. S., with Walker, A. L., *Geochemical processes in ore formation—Pt. I. The production of hydrothermal fluids from sedimentary sequences. Pt. II. Kinetics of high temperature gas phase metal transport and the relation of the model systems to the natural environment*, 919–931
Burnham, C. W., with Jahns, R. H., *Experimental studies of pegmatite genesis: I. A model for the derivation and crystallization of granitic pegmatites*, 843–864

California:
  mercury, Mt. Jackson, 489
Cameron, W. L., with Chace, F. M., Cumberlidge, J. T., and Van Nort, S. D., *Applied geology at the Nickel Mountain mine, Riddle, Oregon*, 1–16
Carbon:
  abundance, phosphate rock, Florida, 667
  isotopes, ratios, British Columbia, 479
  isotopes, ratios, Pine Point, 733
Carbonate sediments and reefs, Yucatan shelf, Mexico (review), 476–477
Carpenter, R. H., Fagan, J. M., and Wedow, Helmuth, Jr., abstract by, 348
Chace, F. M., Cumberlidge, J. T., Cameron, W. L., and Van Nort, S. D., *Applied geology at the Nickel Mountain mine, Riddle, Oregon*, 1–16
Chakrabarti, A. K., *Analysis of ore fabric*, 223–227; *On the effects of igneous intrusion on a few coal seams of the Jharia coal field, Bihar, India*, 319–324
Chandra, D., *Refractive indices of coals carbonized under pressure*, 338–340

Chao, T. T., *Determination of gold in waters in the nanogram range by anion exchange and atomic absorption spectrophotometry*, 287–290
Chaudhuri, S., and Faure, G., discussion of paper by, 342–346
Chemical analysis:
anion exchange-atomic absorption, gold, nanogram range, 287
atomic absorption, mercury, dithizone extraction, 825
fluorimetry, uranium, 50
Chemical brecciation, an unrecognized mechanism for breccia formation? (Sawkins), 613–617
Chemical composition of the hydrothermal fluids responsible for the lead-zinc deposits at Providencia, Zacatecas, Mexico (Rye and Haffty), 629–643
Chrismas, L., Baadsgaard, H., Folinsbee, R. E., Fritz, P., Krouse, H. R., and Sasaki, A., *Rb/Sr, S, and O isotopic analyses indicating source and date of contact metasomatic copper deposits, Craigmont, British Columbia, Canada*, 479–488
Christmas, Arizona:
genesis, skarn petrology, 255
Chromite:
India, Nausahi, textures, composition, 329
Philippine Islands, ore deposits, general, 644
Chromium:
geochemistry, placers, Guyana, 910
Chronology of intrusion, volcanism, and ore deposition at Bingham, Utah (discussion), 228; (reply to discussion), 229
Clays:
geochemistry, isotope ratios, oxygen, hydrogen, 755
Georgia, east-central, 834
Clot textures developed in the chromitites of Nausahi, Keonjhar District, Orissa, India (Mukherjee), 329–337
Coal:
experimental studies, carbonization, pressure, refractive index, 338
India, Jharia, metamorphism, 319
India, properties, 683, 809
physical properties, metamorphic aureole, 319
Cohen, N. E., Brooks, R. R., and Reeves, R. D., *Pathfinders in geochemical prospecting for uranium in New Zealand*, 519–525
Collins, L. G., *Regional recrystallization and the formation of magnetite concentrations, Dover magnetite district, New Jersey*, 17–33; *Host rock origin of magnetite in pyroxene skarn and its relation to alaskite and hornblende granite*, 191–201
Colorado:
mineralogy, violarite, Boulder County, 91
polymetallic ores, Creede, 696
Commission on ore microscopy (Bowie), 110–111
Comparative evaluation of scintillometric, geochemical, and biogeochemical methods of prospecting for uranium, A (Whitehead and Brooks), 50–55; (discussion), 933; (reply to discussion), 933–934
Continental shelf:
Bering Sea, mineral resources, 116
Copper:
abundance, volcanics, acid soluble, 672
Alaska, Ruby Creek, occurrence, 75
Argentina, San Francisco de los Andes, 271
Arizona, Christmas, 255
Arizona, San Manuel, zoning, 118
British Columbia, Craigment, isotopes, 479
British Columbia, Phoenix mine, 822
geochemistry, abundance, fluid inclusions, 629
geochemistry, native, trace metals, 455
geochemistry, Poland, copper shale, 115
geochemistry, porphyry copper, 755
geochemistry, porphyry copper, mineral distribution, 833
India, Singhbhum shear zone, 695
Michigan, Copper Harbor Conglomerate, 462
Michigan, White Pine, absolute age, 342
New Brunswick, Heath Steele, zoning, 509
Ontario, Batchawana Bay, 551
Philippine Islands, ore deposits, general, 644
Poland, Fore-Sudetian, 115
Queensland, Mount Morgan, 885
Tennessee, Ducktown, metamorphism, 118
Utah, Bingham, 34
Utah, Bingham, absolute age, 228, 229
Utah, East Tintic, absolute age, 915
Copper mineralization in the upper part of the Copper Harbor Conglomerate at White Pine, Michigan (discussion), 462–464
Cornelius, K. D., *The Mount Morgan mine, Queensland—a massive gold-copper pyritic replacement deposit*, 885–902
Correction to article:
Evolution of the Fore-Sudetian copper deposit (Oberc and Serkies, v. 63, no. 4, 372–379), 115
Mineralogy and sulfur isotopes of the Ruby Creek copper prospect, Bornite, Alaska (Runnells, v. 64, no. 1, 84), 364
Wall rock alteration at the Boliden deposit, Sweden (Nilsson, v. 63, no. 5, 472–494), 468
Cortez, Nevada:
gold, geology, geochemistry, 526
Creede, Colorado:
mineral deposits, genesis, 696
Crocket, J. H., with Lusk, John, *Sulfur isotope fractionation in coexisting sulfides from the Heath Steele B-1 orebody, New Brunswick, Canada*, 147–155; discussion of paper by, 829
Crust:
composition, metals, source, 576
structure, Europe, Asia, 693
Crystal chemistry:
pegmatite, phase relations, 843
phosphates, sea water, 365
Cumberlidge, J. T., with Chace, F. M., Cameron, W. L., and Van Nort, S. D., *Applied geology at the Nickel Mountain mine, Riddle, Oregon*, 1–16
Cumming, G. L., and Robertson, D. K., *Isotopic composition of lead from the Pine Point deposit*, 731–732
Curtis, C. D., and Spears, D. A., discussion of paper by, 341
Czamanske, G. K., *The stability of argentopyrite and sternbergite*, 459–461
Czechoslovakia:
veins, textures, interpretation, 564
geochemistry, Li-granite cupola, 392

Dasch, E. J., Petrović, Radomir, and Bachinski, D. J., books received by, 124–127
Deformation:
experimental studies, plastic flow, sulfides, 500
field studies, brecciation, chemical, 613
theoretical studies, mechanism, superposed folds, 117
Delavault, R. E., with Warren, H. V., *Aqua regia extractable copper and zinc in volcanic rocks in relation to copper mineralization*, 672–676
Determination of gold in waters in the nanogram range by anion exchange and atomic absorption spectrophotometry (Chao), 287–290
Determination of sampling and analytical errors in exploration geochemistry, The (Garrett), 568–569
Determination of trace mercury in soil and rock media (Pyrih and Bisque), 825–828
Determining fineness variation characteristics in gold ores by reflectometry (discussion), 341–342
Development and utilization of mineral resources—a Cento symposium held in Karachi, Pakistan, 1968, 594
Devonian:
Northwest Territories, paleogeography, 711
Devonian laterite in Chitral State, West Pakistan (Stauffer), 452–454
de Waal, S. A., *Ramsdellite from the Hotazel mine, Northern Cape Province, South Africa*, 221–223
Diagenesis:
cementation, copper, Michigan, 462

clays, kaolinitization, Georgia, 834
limestone, dolomitization, 743
Diapirs:
mechanism, inverted, New Jersey, Sterling Hill, 833
di Colbertaldo, Dino, review of book by, 124
Discussions:
Age and genesis of quartz-porphyry near White Pine, Michigan (Chaudhuri and Faure; Sales), Brooks and Garbutt, 342–346
Bond strength and sulfur isotopic fractionation in coexisting sulfides (Bachinski), Nickel, 934–935; (Nickel, discussion by), Bachinski, 936
Chronology of intrusion, volcanism, and ore deposition at Bingham, Utah (Moore, Lanphere, and Obradovich), Gilluly, 228; (Gilluly), Moore, Lanphere, and Obradovich, 229
Comparative evaluation of scintillometric, geochemical and biogeochemical methods of prospecting for uranium, A (Whitehead and Brooks), Bowie and Ostle, 933; (Bowie and Ostle, discussion by), Whitehead and Brooks, 933–934
Copper mineralization in the upper part of the Copper Harbor Conglomerate at White Pine, Michigan (Ohle; Brecke), Hamilton, 462–464
Determining fineness variation characteristics in gold ores by reflectometry (Eales), Stumpfl, 341–342
Formation of sedimentary iron minerals, The (Curtis and Spears), Bubenicek, 341
Further remarks on the origin of massive sulfide deposits (Anderson; Lusk and Crocket), Boyle, 829
Hydrothermal transport and deposition of gold (Helgeson and Garrels), Boyle, 112–115; Ewers, 575
Noncolloidal origin of colloform textures (Roedder), Harańczyk, 466–468
Ore metals from the crust or mantle (Krauskopf), Petrascheck, 576–578
Origin of asbestos deposits of Cuddapah belt, Andhra Pradesh (Rao), Laubscher, 936
Possible relation of mineralization to thermal springs in the Creede district, San Juan Mountains, Colorado (White), Steven, 696–698
Potash-bearing evaporites—Danakil area (Holwerda and Hutchinson; Mohr), Tazieff, 228–229
Role of some statistical and mathematical methods in the interpretation of regional geochemical data, The (Nichol, Garrett, and Webb), Parsley and Doveton, 830
Sulfide mineralization in the Singhbhum shear zone (Schnellman), Talapatra, 695–696
Use of diagram (Knutsen), Sturman, 464–465
Dolomite:
genesis, ground water, geochemistry, 349
genesis, hydrothermal, 743
Dover, New Jersey:
magnetite deposits, 17
Doveton, J. D. H., with Parsley, A. J., discussion by, 830
Dreyer, R. M., abstract by, 937–938
Ducktown, Tennessee:
genesis, metamorphism, 118

Eales, H. V., discussion of paper by, 341–342
Earth sciences in Canada—a centennial appraisal and forecast, The (review), 242, 594
Earthquakes:
epicenters, Europe, Asia, atlas, 693
East Tintic, Utah:
absolute age, dates, 915
Economic geology:
history, mineral exploration, North America, 569
methods, applied geology, 1
methods, classification, sulfide deposits, 835
methods, sampling, ore deposits, 834
practice, automatic data processing, 117
practice, bauxite deposits, evaluation, 937
practice, bentonite deposits, evaluation, 939
practice, cement materials, evaluation, 938
practice, exploration programs, 116
practice, feldspar deposits, evaluation, 938
practice, fluorspar deposits, evaluation, 938
practice, gypsum deposits, evaluation, 937
practice, nickel deposits, evaluation, 937
practice, potash deposits, evaluation, 937
practice, research programs, 72
practice, talc deposits, evaluation, 938
resources, Philippines, general, 644
resources, zinc, lead, Northwest Territories, 711
Economic geology research (Mitcham), 72–74
Egypt:
iron, El-Gidida, 424
phosphate, Quseir-Safaga area, 172
Elastic properties:
sulfides, experimental studies, 500
El-Gidida iron ores and their origin, Bahariya Oases, Western Desert, U. A. R. (Basta and Amer), 424–444
Elliott, J. E., with Wells, J. D., and Stoiser, L. R., *Geology and geochemistry of Cortez gold deposit, Nevada*, 526–537
Ellipsometric determination of optical constants of metals: a contribution to reflectivity standards for ore microscopy (Jansen, Sorensen, and Kearney), 325–328
El-Tarabili, El-Sayed, *Paleogeography, paleoecology and genesis of the phosphatic sediments in the Quseir-Safaga area*, 172–182
Encyclopedia of the earth's interior, An (Milyutina), 693–694
Esselaar, P. A., with Saager, R., *Factor analysis of geochemical data from the Basal Reef, Orange Free State Goldfield, South Africa*, 445–451
Ethiopia:
structural geology, Danakil area, 228
Europe:
geophysical surveys, seismic, atlas, 693
Evans, L. L., with McCormick, J. E., Palmer, R. A., and Rasnick, F. D., abstract by, 353
Evolution of the Fore-Sudetian copper deposit (Oberc and Serkies, correction, v. 63, no. 4, 372–379), 115
Ewers, W. E., discussion by, 575
Experimental data bearing on the movement of iron in an aqueous vapor (Martin and Piwinskii), 798–803
Experimental deformation and annealing of sulfides and interpretation of ore textures (Gill), 500–508
Experimental studies of pegmatite genesis: I. A model for the derivation and crystallization of granitic pegmatites (Jahns and Burnham), 843–864

Factor analysis of geochemical data from the Basal Reef, Orange Free State Goldfield, South Africa (Saager and Esselaar), 445–451
Fagan, J. M., with Carpenter, R. H., and Wedow, Helmuth, Jr., abstract by, 348
Faure, G., with Chaudhuri, S., discussion of paper by, 342–346
Feldspar:
ore deposits, general, evaluation, 938
Florida:
geochemistry, phosphate, color, 667
hydrogeology, Tertiary limestone, 349
Fluid inclusion temperature measurements in the east Tennessee zinc district (Miller), 109–110
Fluid inclusions:
composition, formation waters, comparison, 385
composition, Tennessee, zinc deposits, 353
sphalerite, Northwest Territories, Pine Point, 466
thermometry, Bolivia, ores, 118
thermometry, Tennessee, fluorite, 109
zinc-copper ore, Mexico, Providencia, 629
Fluorspar:
exploration, geology applications, 938
Tennessee, fluid inclusions, 109
Folds:
mechanism, inverted diapir, 833
superposed, geometry, 117
Folinsbee, R. E., with Chrismas, L., Baadsgaard, H., Fritz, P., Krouse, H. R., and Sasaki, A., *Rb/Sr, S, and O*

isotopic analyses indicating source and date of contact metasomatic copper deposits, Craigmont, British Columbia, Canada, 479–488
Folinsbee, R. E., with Jackson, S. A., *The Pine Point lead-zinc deposits, N.W.T., Canada—introduction and paleoecology of the Presqu'ile reef*, 711–717
Forbes, R. B., and Barsdate, R. J., *Trace metal zonation in a native copper nugget from the McCarthy district, Alaska*, 455–458
Formation of sedimentary iron minerals, The (discussion), 341
France:
iron, Lorraine, 341
French, B. M., and Short, N. M., review of book edited by, 242
Fritz, P., with Chrismas, L., Baadsgaard, H., Folinsbee, R. E., Krouse, H. R., and Sasaki, A., *Rb/Sr, S, and O isotopic analyses indicating source and date of contact metasomatic copper deposits, Craigmont, British Columbia, Canada*, 479–488
Fritz, Peter, *The oxygen and carbon isotopic composition of carbonates from the Pine Point lead-zinc ore deposits*, 733–742
Fulweiler, R. E. and McDougal, S. E., abstract by, 348–349
Fumaroles:
gases, iron, migration, 798
Further remarks on the origin of massive sulfide deposits (discussion), 829

Gambel, Bohuslav, and Jarkovský, Jan, review of book by, 595
Garbutt, P. L., with Brooks, E. R., discussion by, 342–346
Garrels, R. M., with Helgeson, H. C., discussion of paper by, 112–115, 575
Garrett, R. G., *The determination of sampling and analytical errors in exploration geochemistry*, 568–569
Garrett, R. G., with Nichol, Ian, and Webb, J. S., *The role of some statistical and mathematical methods in the interpretation of regional geochemical data*, 204–220; discussion of paper by, 830
Generalized Bayesian classification functions: K classes (Wignall), 571–574
Geochemical analysis:
fluorimetry, uranium, 933
reflectometry, gold, fineness, 341
Geochemical processes in ore formation—Pt. I. The production of hydrothermal fluids from sedimentary sequences. Pt. II. Kinetics of high temperature gas phase metal transport and the relation of the model systems to the natural environment (Walker and Buchanan), 919–931
Geochemical profile through an ore-bearing lithium granite (Štemprok and Šulcek), 392–404
Geochemical prospecting:
analytical technique, mercury, 825
copper, zinc, British Columbia, 672
gold, Nevada, Cortez, pathfinders, 526
lead, India, 677
sampling, error, determination, 568
statistical methods, Bayesian classification functions, 571
statistical methods, graphical representation, 538
stream sediments, statistical analysis, 204, 830
suspended solids technique, copper, east Tennessee, 832
uranium, ground methods, evaluation, 50
uranium, New Zealand, 519
uranium, soils, water, 933
water, bacteria, interference, 832
Geochemie der Pyrite einiger Lagerstätten der Tschechoslowakei (review), 595
Geochemistry:
abundance of elements, coefficient of variation, 834
abundance of elements, stream sediments, 204
abundance of elements, volcanics, 672
ground water, dolomitization, regional, 349
methods, gold, analysis, 287
phosphate, marine, genesis, 365
processes, diffusion, 575
processes, fractionation, pegmatite, 843
processes, gas evolution, 919
processes, gas transfer, iron, 798
processes, hydrothermal alteration, serpentinite, 489
processes, isotope fractionation, 618, 718, 733
processes, isotope fractionation, prediction, 56, 934, 936
processes, isotope fractionation, sulfides, 147
processes, oxidation-reduction reactions, sulfur, 160
processes, sulfide concentration, 129
reaction kinetics, gas transfer, 923
redox reactions, sulfur, iron, 291
solubility, alunite, 599
solubility, gold, 112
solubility, magmas, iron-sulfide liquid, 865
solubility, phosphate, 365
thermal springs, metals, deposition, 156
Geologic thermometry:
fluid inclusions, fluorite, Tennessee, 109
fluid inclusions, Tennessee, east, 353
methods, comparison, ores, Bolivia, 118
methods, fluid inclusions, 629
methods, isotope fractionation, 718
methods, mineral stabilities, Arizona, 255
methods, mineral stabilities, pegmatite, 66
methods, pyrrhotite, phase equilibria, 405, 420
methods, sulfur, isotopes, fractionation, 56, 934, 936
ores, Bolivia, 118
Geological exploration:
methods, apparent-dip diagram, 464
Geology and genesis of the Bi-Cu mineralized breccia-pipe, San Francisco de los Andes, San Juan, Argentina, The (Llambías and Malvicini), 271–286
Geology and geochemistry of Cortez gold deposit, Nevada (Wells, Stoiser, and Elliott), 526–537
Geology of mineral deposits (Geologiya rudnykh mestorozhdeniy) (review), 120–123, 231–242, 354–361, 469–476, 586–594, 701–707, 940–947
Geomorphology:
fluvial features, pediments, mineral exploration, 117
solution features, karst, 352
solution features, paleokarst, Ordovician, Tennessee, 348, 349, 350, 351, 353
Georgia:
clays, east-central, 834
Geosynclines:
metallogenesis, sulfide deposits, classification, 835
sedimentation, barite, Nevada, 245
Ghosh, T. K., *Petrography and coking potentiality of Indian coals*, 683–690
Giacimenti minerari. Vol. 1 (review), 124
Gill, J. E., *Experimental deformation and annealing of sulfides and interpretation of ore textures*, 500–508
Gilluly, James, discussion by, 228; reply to discussion by, 229
Gold:
analysis, nanogram range, 287
Bering Sea, exploration, 116
geochemistry, correlations, 822
geochemistry, hydrothermal transport, 112, 575
Nevada, Cortez, 526
North Carolina, Slate Belt, 118
ore deposits, general, ore-forming fluids, 95
Philippine Islands, ore deposits, general, 644
properties, fineness, reflectometric determination, 341
Queensland, Mount Morgan, 885
South Africa, Steynsdorp Goldfield, 778
South Africa, Witwatersrand, 445
Gold-silver ore-grade precipitates from New Zealand thermal waters (Weissberg), 95–108
Granger, H. C., and Warren, C. G., *Unstable sulfur compounds and the origin of roll-type uranium deposits*, 160–171
Ground water:
Alberta, composition, western Canada basin, 385
composition, bacteria, metal precipitating, 832
Florida, composition, 349

Mexico, composition, Yucatan, 349
Northwest Territories, paleo-movements, Pine Point, 385
United States, southeastern, movement, 352
Guatemala:
geochemistry, general, geochemical prospecting, 538
Gude, A. J., with Hemley, J. J., Hostetler, P. B., and Mountjoy, W. T., *Some stability relations of alunite*, 599–612
Guidebook of northern Utah (review), 708
Guilbert, J. M., and Lowell, J. D., abstract by, 118–119
Gulbrandsen, R. A., *Physical and chemical factors in the formation of marine apatite*, 365–382
Guyana:
mineralogy, merumite, Merume River, 910
Gypsum:
ore deposits, general, evaluation, 937

Hadley, J. B., with Zen, E-an, White, W. S., and Thompson, J. B., Jr., review of book edited by, 124
Haffty, Joseph, with Rye, R. O., *Chemical composition of the hydrothermal fluids responsible for the lead-zinc deposits at Providencia, Zacatecas, Mexico*, 629–643
Hagegeorge, C. G., with Hill, W. T., and Morris, R. G., abstract by, 350
Hagni, R. D., Masiello, R. A., and Tumialan, P. H., *Metamorphic aspects of the magnetite-hematite deposit at Benson mines, New York*, 183–190
Hall, H. T., with Yund, R. A., *Hexagonal and monoclinic pyrrhotites*, 420–423
Hamilton, S. K., reply to discussion of paper by, 462–464
Hanshaw, B. B., and Back, William, abstract by, 349
Harańczyk, Czesław, discussion by, 466–468
Harris, L. D., abstract by, 349
Heath Steele, New Brunswick:
base-metal zoning, 509
geochemistry, sulfur, isotopes, 147
Heavy minerals:
Guyana, Merume River, chromium placers, 910
Helgeson, H. C., and Garrels, R. M., discussion of paper by, 112–115, 575
Hemley, J. J., Hostetler, P. B., Gude, A. J., and Mountjoy, W. T., *Some stability relations of alunite*, 599–612
Henderson, F. B., III, *Hydrothermal alteration and ore deposition in serpentinite-type mercury deposits*, 489–499
Hexagonal and monoclinic pyrrhotites (Yund and Hall), 420–423
Hill, W. T., and Wedow, Helmuth, Jr., abstract by, 350–351
Hill, W. T., McCormick, J. E., and Wedow, Helmuth, Jr., abstract by, 349–350
Hill, W. T., Morris, R. G., and Hagegeorge, C. G., abstract by, 350
History:
mineral exploration, North America, 1756, 569
Hoagland, A. D., abstract by, 351
Holland, H. D., with Raymahashay, B. C., *Redox reactions accompanying hydrothermal wall rock alteration*, 291–305
Holwerda, J. G., and Hutchinson, R. W., discussion of paper by, 228–229
Hopkins, D. M., Nelson, C. H., Tagg, A. R., and Wang, F., abstract by, 116
Host rock origin of magnetite in pyroxene skarn and gneiss and its relation to alaskite and hornblende granite (Collins), 191–201
Hostetler, P. B., with Hemley, J. J., Gude, A. J., and Mountjoy, W. T., *Some stability relations of alunite*, 599–612
Hutchinson, R. W., with Holwerda, J. G., discussion of paper by, 228–229
Hydrogen:
isotopes, ratios, 755
Hydrogeology:
geochemistry, dolomite, genesis, 349
geochemistry, gold, analysis, 287
geochemistry, suspended solids, metal enrichment, 832
geochemistry, thermal, mineral waters, 95
geochemistry, thermal springs, metals, 156
ground-water movement, limestone aquifers, 352
Hydrothermal alteration:
argillic, experimental studies, 599
argillic, isotope ratios, oxygen, hydrogen, 755
dolomitization, phase equilibria, 743
Ontario, breccia pipe, 551
oxidation, leaching, Nevada, Cortez, 526
parageneses, textures, cockade, 564
phase relations, system Fe-S-O, 291
processes, California, mercury, 489
serpentinization, South Africa, asbestos deposits, 936
skarn, geochemistry, isotopes, 479
zoning, lithium granite cupola, 392
zoning, metal ratios, changes, 834
zoning, porphyry copper, 118
zoning, Queensland, Mount Morgan, 885
zoning, thermal waters, New Zealand, 95
zoning, Utah, Bingham, 34
Hydrothermal alteration and ore deposition in serpentinite-type mercury deposits (Henderson), 489–499
Hydrothermal alteration of a breccia pipe deposit, Tribag mine, Batchawana Bay, Ontario (Armbrust), 551–563
Hydrothermal transport and deposition of gold (discussion), 112–115, 575

Igneous rocks:
anorthosite, alteration, 834
differentiation, iron-sulfide liquid, 865
differentiation, manganese content, Montana, 835
gabbro, petrology, Ontario, 833
granite, absolute age, New Mexico, 903
granite, geochemistry, Li-rich, 392
pegmatite, geologic thermometry, 66
pegmatite, petrology, 843
porphyry, general description, Utah, 34
rhyolite, absolute age, Michigan, 342
ultramafic, differentiation, India, 329
ultramafic, weathering, 1
volcanics, absolute age, Utah, 915
volcanics, intrusions, correlation, 228, 229
volcanics, massive sulfide deposits, 129
Igneous rocks and hydrothermal alteration at Bingham, Utah (Bray), 34–49
India:
asbestos, Andhra Pradesh, 936
chromite, Nausahi, 329
coal, Jharia field, 319
coal, petrography, 683, 809
copper, Singhbhum, 695
iron, Mysore, Kemmangandi, 202
lead-zinc, Gujarat, 677
petrology, Nausahi, Orissa, chromitite, 329
petrology, pegmatite, geologic thermometry, 66
Instructions for North American Geological investigation: 1756. By Nicholas Crisp, (Berkeley and Berkeley, eds.), 569–571
Intrusions:
breccia pipes, genesis, 832
layered, petrology, Ontario, 833
mechanism, stocks, dikes, Utah, 34
pipes, Ontario, hydrothermal alteration, 551
Iron:
Egypt, El-Gidida, 424
geochemistry, magma, liquid immiscibility, 865
geochemistry, migration, vapor phase, 798
geochemistry, minette ores, 341
geochemistry, pyrrhotite, phase equilibria, 405, 420
geochemistry, redox reactions, 291
India, Mysore, Kemmangandi, 202
New Jersey, Dover, geochemistry, 17
New York, Benson mines, 183
Pakistan, Chitral, Devonian laterite, 452
Philippine Islands, ore deposits, general, 644
Tennessee, age, 348
Wyoming, Iron Mountain, 834
Iron Mountain, Wyoming:
iron, titanium, source rocks, 834

Isctopes:
carbon, carbonates, ratios, 733
carbon, fractionation, dolomite, genesis, 349
copper ore, sulfur, oxygen, carbon, Rb/Sr, 479
hydrogen, ratios, porphyry copper, 755
lead, ore, ratios, 731
oxygen, carbonates, ratios, 733
oxygen, ratios, porphyry copper, 755
ratios, Rb/Sr, 479
strontium, ratios, New Mexico, Questa, 903
sulfur, fractionation, prediction, 56, 934, 936
sulfur, ratios, 618, 718
sulfur, ratios, coexisting sulfides, 75, 147
sulfur, ratios, New Mexico, Questa, 903
sulfur, ratios, oxidation-reduction reactions, 160
Isotopic composition of lead from the Pine Point deposit (Cumming and Robertson), 731–732

Jackson, S. A., and Folinsbee, R. E., *The Pine Point lead-zinc deposits, N.W.T., Canada—introduction and paleoecology of the Presqu'ile reef*, 711–717
Jackson, S. A., with Billings, G. K., and Kesler, S. E., *Relation of zinc-rich formation waters, northern Alberta, to the Pine Point ore deposit*, 385–391
Jahns, R. H., and Burnham, C. W., *Experimental studies of pegmatite genesis: I. A model for the derivation and crystallization of granitic pegmatites*, 843–864
Jansen, G. J., Sorensen, J. M., and Kearney, R. J., *Ellipsometric determination of optical constants of metals: a contribution to reflectivity standards for ore microscopy*, 325–328
Jarkovský, Jan, with Gambel, Bohuslav, review of book by, 595
Jensen, M. L., ed., review of book edited by, 708
Jensen, M. L., with Both, R. A., Rafter, T. A., and Solomon, M., *Sulfur isotopes and zoning of the Zeehan mineral field, Tasmania*, 618–628
Jones, R. L., with Ahmad, N., *Occurrence of aluminous lateritic soils (bauxites) in the Bahamas and Cayman Islands*, 804–808
Jordanite at Balmat, New York (Lessing), 932

Kaolin:
Georgia, east-central, 834
K-Ar chronology and sulfur and strontium isotope ratios at the Questa mine, New Mexico (Laughlin, Rehrig, and Mauger), 903–909
Kearney, R. J., with Jansen, G. J., and Sorensen, J. M., *Ellipsometric determination of optical constants of metals: a contribution to reflectivity standards for ore microscopy*, 325–328
Kelly, W. C., and Turneaure, F. S., abstract by, 118
Kentucky:
zinc, fluid inclusions, 353
Kesler, S. E., with Billings, G. K., and Jackson, S. A., *Relation of zinc-rich formation waters, northern Alberta, to the Pine Point ore deposit*, 385–391
Kiff, I. T., with Worthington, J. E., abstract by, 118
Knutsen, R. M., discussion of paper by, 464–465
Koschman, A. H., and Bergendahl, M. H., review of book by, 124
Krauskopf, K. B., discussion of paper by, 576–578
Krishna Rao, J. S. R., with Sastry, C. A. and Murthy, D. S. N., *Origin of iron ores of Kemmangandi, Bababudan Hill ranges of Mysore state, India*, 202–203
Krouse, H. R., with Chrismas, L., Baadsgaard, H., Folinsbee, R. E., Fritz, P., and Sasaki, A., *Rb/Sr, S, and O isotopic analyses indicating source and date of contact metasomatic copper deposits, Craigmont, British Columbia, Canada*, 479–488
Krouse, H. R., with Sasaki, Akira, *Sulfur isotopes and the Pine Point lead-zinc mineralization*, 718–730

Lake Superior region:
stratigraphy, Precambrian, Keweenawan, breccia pipes, 551
Lanphere, M. A., with Moore, W. J., and Obradovich, J. D., discussion of paper by, 228; reply to discussion of paper by, 229
Laterites:
composition, mineral deposits, evaluation, 937
composition, West Indies, 804
Pakistan, Devonian age, 452
physical properties, Oregon, Riddle, 1
Laubscher, D. H., discussion by, 936
Laughlin, A. W., Lovering, T. S., and Mauger, R. L., *Age of some Tertiary igneous rocks from the East Tintic district, Utah*, 915–918
Laughlin, A. W., Rehrig, W. A., and Mauger, R. L., *K-Ar chronology and sulfur and strontium isotope ratios at the Questa mine, New Mexico*, 903–909
Laurence, R. A., abstract by, 351–352
Lead:
India, Gujarat, 677
isotopes, ratios, 731
New Brunswick, Bathurst, 829
New Brunswick, Heath Steele, 147
New Brunswick, Heath Steele, zoning, 509
Northwest Territories, Pine Point, 711, 718, 731, 733
Tasmania, Zeehan field, 618
Utah, East Tintic, absolute age, 915
Lead-zinc mineralization in the Champaner rocks of Khandia, Baroda district, Gujarat, India (Yellur), 677–682
Lee, I. K., review of book edited by, 242
LeGrand, H. E., and Stringfield, V. T., abstract by, 352
Lepeltier, Claude, *A simplified statistical treatment of geochemical data by graphical representation*, 538–550
Lessing, Peter, *Jordanite at Balmat, New York*, 932
Limestone:
cement materials, evaluation, 938
Liquidus phase relations in the FeS-FeO-Fe_3O_4-SiO_2 system and their application in geology (MacLean), 865–884
Lithium:
abundance, lithium granite, 392
Little, H. W., *Anhydrite-pegmatite uranium ore at Bancroft, Ontario*, 691–693
Llambías, E. J., and Malvicini, Lidia, *The geology and genesis of the Bi-Cu mineralized breccia-pipe, San Francisco de los Andes, San Juan, Argentina*, 271–286
Logan, B. W., et al., review of book by, 476–477
Lovering, T. S., *The origin of hydrothermal and low temperture dolomite*, 743–754
Lovering, T. S., with Laughlin, A. W., and Mauger, R. L., *Age of some Tertiary igneous rocks from the East Tintic district, Utah*, 915–918
Lowell, J. D., with Guilbert, J. M., abstract by, 118–119
Lusk, John, and Crocket, J. H., *Sulfur isotope fractionation in coexisting sulfides from the Heath Steele B-1 orebody, New Brunswick, Canada*, 147–155; discussion of paper by, 829
Lusk, John, *Base metal zoning in the Heath Steele B-1 orebody, New Brunswick, Canada*, 509–518

MacLean, W. H., *Liquidus phase relations in the FeS-FeO-Fe_3O_4-SiO_2 system and their application in geology*, 865–884
Magmas:
differentiation, chromitite, India, 329
differentiation, liquid immiscibility, 865
differentiation, mineral deposits, genesis, 576
differentiation, Ontario, Sudbury, 833
differentiation, pegmatite, genesis, 843
Magnesium:
geochemistry, dolomite, genesis, 743
geochemistry, dolomitization, regional, 349
Maher, S. W., abstract by, 352–353
Major-element analyses:
bauxitic soils, West Indies, 807
chromite, India, 335
epidiorite, India, Mysore, 202
granite, New Brunswick, 799
granite, Ontario, sericitization, 559

hornblende rocks, New Jersey, iron deposits, 23, 25, 27
igneous rocks, Queensland, Mount Morgan, 889, 890, 892
iron ores, Egypt, 436
laterite, Pakistan, Devonian age, 453
lithium granite, Czechoslovakia, 396, 399
metabasalt, South Africa, 784
perthite, India, pegmatite, 67
plutonic rocks, Argentina, 276
serpentinite, California, mercury deposits, 493, 494
Malvicini, Lidia, with Llambías, E. J., *The geology and genesis of the Bi-Cu mineralized breccia-pipe, San Francisco de los Andes, San Juan, Argentina*, 271–286
Manganese:
abundance, batholith, Montana, 835
New Jersey, Sterling Hill, structure, 833
South Africa, Hotazel mine, occurrence, 221
Mantle:
composition, metals, source, 576
composition, sulfide liquid, 865
structure, Europe, Asia, 693
Marine geology:
mineral resources, Bering Sea, exploration, 116
Martin, R. F., and Piwinskii, A. J., *Experimental data bearing on the movement of iron in an aqueous vapor*, 798–803
Masiello, R. A., with Hagni, R. D., and Tumialan, P. H., *Metamorphic aspects of the magnetite-hematite deposit at Benson mines, New York*, 183–190
Massive sulfide deposits and volcanism (Anderson), 129–146
Mauger, R. L., with Laughlin, A. W., and Lovering, T. S., *Age of some Tertiary igneous rocks from the East Tintic district, Utah*, 915–918
Mauger, R. L., with Laughlin, A. W., and Rehrig, W. A., *K-Ar chronology and sulfur and strontium isotope ratios at the Questa mine, New Mexico*, 903–909
McAnulty, W. N., abstract by, 938
McBirney, A. R., ed., review of book edited by, 476–477
McCormick, J. E., Evans, L. L., Palmer, R. A., and Rasnick, F. D., abstract by, 353
McCormick, J. E., with Hill, W. T., and Wedow, Helmuth, Jr., abstract by, 349–350
McDougal, S. E., with Fulweiler, R. E., abstract by, 348–349
Mercury:
analysis, atomic absorption, 825
California, Mt. Jackson mine, 489
Merumite occurrence in Guyana (Milton and Narain), 910–914
Metallogenesis and ore control in the Steynsdorp Goldfield, Barberton Mountain Land, South Africa (Viljoen, Saager, and Viljoen), 778–797
Metals:
classification, sulfide deposits, 835
exploration, bacterial interference, 832
exploration, geochemical prospecting, 204, 830
exploration, suspended solids technique, 832
genesis, epigenetic, syngenetic, 117
genesis, review, 576
genesis, thermal springs, 156
properties, optical, ellipsometry, 325
Metamorphic aspects of the magnetite-hematite deposit at Benson mines, New York (Hagni, Masiello, and Tumialan), 183–190
Metamorphic rocks:
amphibolite, petrology, alteration, 17
metallic ores, general description, 129
metallic ores, geochemistry, 118
metallic ores, structural features, New Jersey, 833
metallic ores, textures, 183
skarn, magnetite deposits, 191
skarn, petrology, Arizona, 255
Metamorphism:
contact, asbestos, South Africa, 936
experimental studies, coal, pressure, 338
experimental studies, gas evolution, 919
experimental studies, sulfides, deformation, 500
migration of elements, gold, South Africa, 778
migration of elements, iron, gas transfer, 798
migration of elements, iron, magnetite deposits, 17, 191
migration of elements, iron, titanium, 834
regional, isotopes, coexisting sulfides, 147, 829
rheomorphism, New Jersey, Sterling Hill, 833
Metasomatism:
carbonate rocks, dolomitization, 743
process, textures, interpretation, 564
Mexico:
geochemistry, Providencia, fluid inclusions, 629
hydrogeology, Yucatan, 349
Michigan:
absolute age, Keweenawan, 342
copper, Copper Harbor Conglomerate, 462
copper, White Pine, 342
Micromineralogy of silver-bearing sphalerite from Flat River, Missouri (Taylor and Radtke), 306–318
Microscope methods:
ellipsometry, metals, 325
general, commission on ore microscopy, 110
Miller, J. D., *Fluid inclusion temperature measurements in the east Tennessee zinc district*, 109–110
Milton, Charles, and Narain, Sat, *Merumite occurrence in Guyana*, 910–914
Milyutina, Yekaterina, *An encyclopedia of the earth's interior*, 693–694
Mineragraphy:
general, commission on ore microscopy, 110
optical constants, determination, ellipsometry, 325
reflectivity, coal, India, 683
reflectivity, coal, metamorphism, 319
reflectivity, determination, ellipsometry, 325
reflectivity, gold, fineness, determination, 341
textures, bismuth-copper ores, 271
textures, chromitite, India, 329
textures, cockade, interpretation, 564
textures, colloform, interpretation, 466
textures, experimental studies, 500, 865
textures, framboidal, synthetic, 383
textures, gold ores, South Africa, 778
textures, iron ore, New York, 183
textures, iron ores, Egypt, 424
textures, lead-zinc ore, Missouri, 306
textures, manganese ores, South Africa, 221
textures, pyrrhotite, experimental studies, 405
textures, violarite, Colorado, 91
Mineral data:
alunite, geochemistry, 599
anhydrite, Ontario, Bancroft, 691
apatite, geochemistry, sediments, 365
argentopyrite, thermochemical values, 459
biotite, manganese content, 835
carbonates, geochemistry, isotopes, 733
chromium minerals, occurrence, Guyana, 910
copper, native, trace elements, 455
cymrite, occurrence, 75
dolomite, geochemistry, 743
fluorite, fluid inclusions, 109
gold, fineness, determination, 341
hematite, synthesis, vapor phase, 798
jordanite, New York, Balmat, 932
mafic silicates, composition, New Jersey, 17
metallic sulfides, reaction kinetics, gas phases, 923
pyrite, framboids, synthesis, 383
pyrite, trace-element content, 129
pyrrhotite, experimental studies, 405, 420
ramsdellite, South Africa, occurrence, properties, 221
sphalerite, micromineralogy, 306
sphalerite, textures, colloform, interpretation, 466
sternbergite, thermochemical values, 459
sulfides, bond strengths, estimated, 56, 934, 936
sulfides, deformation, experimental studies, 500
sulfo-salts, Argentina, occurrence, 271
tellurides, Queensland, Mount Morgan, 885
violarite occurrence, Colorado, 91
Mineral deposits, genesis:
asbestos, South Africa, dolomite association, 936

barite, Missouri, southwest, 938
breccia pipes, bismuth-copper, Argentina, 271
breccia pipes, copper, Ontario, 551
breccia pipes, processes, 832
classification, epigenetic, syngenetic, 117
classification, sulfide deposits, 835
contact metamorphic, copper, Arizona, 255
contact metamorphic, Philippines, general, 644
copper, Michigan, White Pine, 342
general, colloform textures, interpretation, 466
gold, Nevada, Cortez, 526
igneous processes, Czechoslovakia, Li-granite, 392
igneous processes, gold, volcanogenic, 118
igneous processes, pegmatite, 843
igneous processes, sulfide melts, 865
iron, Egypt, El-Gidida, 424
iron, France, minette, 341
iron, India, Mysore, Kemmangandi, 202
iron, titanium, Wyoming, Iron Mountain, 834
lead-zinc, Tasmania, Zeehan, 618
manganese, Montana, Philipsburg, 835
massive sulfide, Philippines, general, 644
massive sulfide, Queensland, Mount Morgan, 885
massive sulfide, review, volcanogenesis, 129
massive sulfide, structural controls, 829
massive sulfide, Tennessee, Ducktown, 118
metallogenic provinces, metals, source, 576
metamorphism, gold, remobilization, 778
metamorphism, iron, New Jersey, 17
metamorphism, iron, New York, 183
metamorphism, iron, skarns, 191
metamorphism, petrofabrics, X-ray technique, 223
molybdenum, New Mexico, Questa, 903
ore transport, gold-quartz veins, 112, 575
ore transport, iron, vapor phase, 798
ore transport, reaction kinetics, gas phases, 923
ore-forming fluids, copper, Ontario, 551
ore-forming fluids, differentiation, metal ratios, 834
ore-forming fluids, experimental studies, 599, 919
ore-forming fluids, gold, silver, 95
ore-forming fluids, isotope ratios, oxygen, hydrogen, 755
ore-forming fluids, mercury, California, 489
ore-forming fluids, Mexico, Providencia, 629
ore-forming fluids, Northwest Territories, Pine Point, 733
ore-forming fluids, system Fe-S-O, 291
ore-forming fluids, temperature, 118
ore-forming fluids, thermal springs, New Zealand, 156
ore-forming fluids, zinc, lead, Northwest Territories, 466
ore-forming fluids, zinc, Pine Point, 385
ore-forming fluids, zinc, Tennessee, 349, 353
paleogeographic controls, Northwest Territories, Pine Point, 711
phosphate, Egypt, Quseir-Safaga area, 172
phosphate, general, marine, 365
polymetallic ores, Colorado, Creede, 696
polymetallic ores, Utah, East Tintic, 915
porphyry copper, mineral zoning, 118
porphyry copper, mineralization model, 833
porphyry copper, ore-forming fluid, 755
porphyry copper, Philippines, general, 644
porphyry copper, Utah, Bingham, 34
porphyry molybdenum, British Columbia, 833
source rocks, copper, British Columbia, 479
source rocks, crust vs. mantle, 576
source rocks, evolved gases, 919
source rocks, Northwest Territories, Pine Point, 731
strata-bound, barite, Nevada, 245
strata-bound, copper, Alaska, Ruby Creek, 75
strata-bound, copper, Michigan, 462
strata-bound, copper, Poland, 115
strata-bound, gold, North Carolina, 118
strata-bound, gold, South Africa, 445
strata-bound, New Brunswick, Heath Steele, 509
strata-bound, pyrite, framboids, synthesis, 383
strata-bound, zinc, Appalachians, 351
strata-bound, zinc, lead, Northwest Territories, 718
strata-bound, zinc, manganese, New Jersey, 833
structural controls, Arizona, southern, 116
structural controls, copper, Arizona, 255
structural controls, copper, Michigan, 462
structural controls, gold, South Africa, 778
structural controls, India, Singhbhum, 695
structural controls, iron, New Jersey, 17
structural controls, lead, zinc, India, 677
structural controls, zinc, Tennessee, 348, 350, 352, 353
supergene processes, copper, Alaska, 75
supergene processes, violarite, stability, 91
temperature, zinc, east Tennessee, 109
uranium, geochemistry, 160
uranium, Ontario, anhydrite ore, 691
zinc, barite, iron, Tennessee, east, 348
zinc, Tennessee, 353
zinc, Tennessee, east, 349

Mineral exploration:
geochemical methods, Cu-Zn ratios, volcanics, 672
geachemical methods, Nevada, Cortez, 526
geochemical methods, statistical analysis, 204, 830
geochemical methods, suspended solids technique, 832
geochemical methods, uranium, pathfinders, 519
geologic methods, cement materials, evaluation, 938
geologic methods, feldspar, evaluation, 938
geologic methods, fluorspar, evaluation, 938
geologic methods, potash, 937
geologic methods, talc, evaluation, 938
geophysical methods, uranium, 50, 933
history, North America, 1756, 569
ore guides, Appalachians, zinc, 351
ore guides, Bering Sea, 116
ore guides, blind orebodies, 116
ore guides, epigenetic, syngenetic, 117
ore guides, folded folds, analysis, 117
ore guides, fracture patterns, 116
ore guides, gold veins, geochemistry, 112
programs, gypsum, evaluation, 937
programs, lateritic deposits, nickel, bauxite, 937
programs, pediments, principles, 117
programs, research, 72
programs, sampling error, determination, 568
statistical methods, graphical representation, 538
statistical methods, prospects, evaluation, 571
statistical methods, sampling, coefficient of variation, 834
uranium, automatic data processing, 117

Mineral resources:
Bering Sea, exploration, 116
Northwest Territories, Pine Point, reserves, 711

Mineral zoning:
breccia pipes, Argentina, 271
causes, reaction kinetics, gas transfer, 923
contact metamorphic, Arizona, Christmas, 255
copper, strata-bound, Alaska, Ruby Creek, 75
copper, strata-bound, Poland, 115
general, metal ratios, changes, 834
general, sulfide normative variations, 835
general, system Fe-S-O, 291
lithium granite, Czechoslovakia, 392
massive sulfide, Queensland, Mount Morgan, 885
pegmatite, theoretical model, 843
porphyry copper, hydrothermal alteration, 118
porphyry copper, Utah, Bingham, 34
porphyry molybdenum, British Columbia, 833
strata-bound, New Brunswick, Heath Steele, 509
thermal waters, metals, New Zealand, 95
uranium, ore rolls, 160

Mineralogy:
crystal growth, breccia, chemical, 613
crystal growth, colloform texture, interpretation, 466
crystal growth, native copper, 455
crystal growth, pegmatite, 843
crystal growth, pyrite, framboids, 383
crystal growth, sulfides, recrystallization, 500
crystal growth, textures, cockade, 564
identification, metals, ellipsometry, 325

physical properties, color, phosphate rock, 667
practice, commission on ore microscopy, 110
Mineralogy and sulfur isotopes of the Ruby Creek copper prospect, Bornite, Alaska, The (Runnells), 75–90
Mining geology:
production control, gypsum, 937
production control, nickel, Oregon, Riddle, 1
technology, cement materials, 938
technology, potash, 937
Missouri:
barite, southeast, 938
mineralogy, sphalerite, Flat River, 306
Mitcham, T. W., *Economic geology research*, 72–74
Mohorovicic discontinuity:
seismic studies, Europe, Asia, atlas, 693
Mohr, P. A., reply to discussion by, 228–229
Molybdenum:
British Columbia, Hudson Bay Mountain, 833
New Mexico, Questa, isotopes, 903
Montana:
geochemistry, Boulder batholith, 291
geochemistry, manganese, Philipsburg, 835
Moore, W. J., Lanphere, M. A., and Obradovich, J. D., discussion of paper by, 228; reply to discussion of paper by, 229
Morris, R. G., with Hill, W. T., and Hagegeorge, C. G., abstract by, 350
Mount Morgan mine, Queensland—a massive gold-copper pyritic replacement deposit, The (Cornelius), 885–902
Mount Morgan, Queensland:
gold, copper, genesis, 885
Mountjoy, W. T., with Hemley, J. J., Hostetler, P. B., and Gude, A. J., *Some stability relations of alunite*, 599–612
Mukherjee, S., *Clot textures developed in the chromitites of Nausahi, Keonjhar district, Orissa, India*, 329–337
Multiple regression analysis of precious metal values, Phoenix mine, British Columbia, Canada (Sinclair and Percy), 822–824
Murthy, D. S. N., with Sastry, C. A., and Krishna Rao, J. S. R., *Origin of iron ores of Kemmangandi, Bababudan Hill ranges of Mysore state, India*, 202–203

Narain, Sat, with Milton, Charles, *Merumite occurrence in Guyana*, 910–914
Neale, E. R. W., review of book edited by, 242, 594
Nelson, C. H., with Hopkins, D. M., Tagg, A. R., and Wang, F., abstract by, 116
Nevada:
barite, Nye County, 245
exploration, pediments, 117
geochemistry, Ely, 291
gold, Cortez, 526
New Brunswick:
geochemistry, sulfur, isotopes, 147
metals, Heath Steele, 509
zinc, lead, Bathurst, 829
zinc, lead, Heath Steele, 147
New Jersey:
iron, Dover, 17
iron, Precambrian, petrology, 191
petrology, Dover, magnetite, 17
zinc, manganese, Sterling Hill, 833
New Mexico:
geochemistry, Questa, isotopes, 903
geochemistry, Santa Rita, copper, 755
uranium, exploration, 117
New York:
iron, Adirondacks, petrology, 191
iron, Benson mines, textures, 183
mineralogy, jordanite, Balmat, 932
New Zealand:
geochemistry, Lower Buller Gorge, geochemical prospecting, 519
geochemistry, thermal springs, metals, 156
geochemistry, uranium, geochemical prospecting, 50, 933
gold, silver, hot springs, 95
hydrogeology, thermal waters, gold, silver, 95
Newly discovered bedded barite deposits in East Northumberland Canyon, Nye County, Nevada (Shawe, Poole, and Brobst), 245–254
Nichol, Ian, Garrett, R. G., and Webb, J. S., *The role of some statistical and mathematical methods in the interpretation of regional geochemical data*, 204–220; discussion of paper by, 830
Nickel:
Colorado, Boulder County, 91
Ontario, Sudbury, 833
ore deposits, general, evaluation, 937
Oregon, Riddle, applied geology, 1
Nickel, E. H., discussion by, 934–935; reply to discussion by, 936
Nielson, R. L., with Sheppard, S. M. F., and Taylor, H. P., Jr., *Oxygen and hydrogen isotope ratios of clay minerals from porphyry copper deposits*, 755–777
Nilsson, C. A., *Wall rock alteration at the Boliden deposit* (correction, v. 63, no. 5, 472–494), 468
Noncolloidal origin of colloform textures (discussion), 466–468
Noranda, Quebec:
mineral zoning, 923
North Carolina:
gold, Slate Belt, 118
Northwest Territories:
geochemistry, Pine Point, isotopes, 733
geochemistry, Pine Point, lead isotopes, 731
geochemistry, Pine Point, sulfur isotopes, 718
zinc, lead, Pine Point, 711
zinc, Pine Point, 385
Note on the occurrence of violarite, Copper King mine, Boulder County, Colorado, A (Bird), 91–94
Notice, 710

Oberc, J., and Serkies, J., *Evolution of the Fore-Sudetian copper deposit* (correction, v. 63, no. 4, 372–379), 115
Obradovich, J. D., with Moore, W. J., and Lanphere, M. A., discussion of paper by, 228; reply to discussion of paper by, 229
Occurrence of aluminous lateritic soils (bauxites) in the Bahamas and Cayman Islands (Ahmad and Jones), 804–808
Occurrence of arsenic and the color-causing components in Florida land-pebble phosphate rock, The (Stow), 667–671
Ohle, E. L., reply to discussion by, 462–464
Olson, R. H., abstract by, 938
On the effects of igneous intrusion on a few coal seams of the Jharia coal field, Bihar, India (Chakrabarti), 319–324
Ontario:
copper, Batchawana Bay, 551
geochemistry, Noranda, mineral zoning, 923
petrology, Sudbury, nickel irruptive, 833
uranium, Bancroft, 691
Optical mineralogy:
optical constants, metals, determination, 325
refractive index, coals, carbonization, 338
Ordovician:
Nevada, Nye County, Pinecone Formation, 245
Tennessee, east, porosity, permeability, 350
Tennessee, mineral deposits, 352
Tennessee, paleoaquifers, 349
Tennessee, paleogeography, mineral deposits, 348
Tennessee, zinc, genesis, 349
Ore deposits of the Philippines—an introduction to their geology (Bryner), 644–666
Ore metals from the crust or mantle (discussion), 576–578
Oregon:
nickel, Riddle, 1
Organic materials:
bitumens, sandstone, cupriferous, 462
Origin of hydrothermal and low temperature dolomite, The (Lovering), 743–754

Origin of iron ores of Kemmangandi, Bababudan Hill ranges of Mysore state, India (Sastry, Murthy, and Krishna Rao), 202–203
Ostle, D., with Bowie, S. H. U., discussion by, 933; reply to discussion by, 933–934
Oxygen:
isotopes, ratios, 733, 755
isotopes, ratios, British Columbia, 479
Oxygen and carbon isotopic composition of carbonates from the Pine Point lead-zinc ore deposits, The (Fritz), 733–742
Oxygen and hydrogen isotope ratios of clay minerals from porphyry copper deposits (Sheppard, Nielsen, and Taylor), 755–777

Pacific Ocean:
marine geology, mineral exploration, 116
Pakistan:
Chitral, Devonian laterite, 452
Paleoecology:
Cretaceous, marine, Egypt, 172
Devonian, reefs, Northwest Territories, 711
Paleogeography:
Cretaceous, Egypt, 172
Devonian, Northwest Territories, 711
Paleogeography, paleoecology and genesis of the phosphatic sediments in the Quseir-Safaga area (El-Tarabili), 172–182
Palmer, R. A., with McCormick, J. E., Evans, L. L., and Rasnick, F. D., abstract by, 353
Papadakis, J., review of book by, 594–595
Paragenesis:
breccia pipes, Argentina, 271
contact metamorphic, Arizona, Christmas, 255
interpretation, reaction kinetics, gas transfer, 923
interpretation, textures, cockade, 564
iron ore, Egypt, 424
lead-zinc ore, Tasmania, sulfur isotopes, 618
massive sulfide, Queensland, Mount Morgan, 885
pegmatite, India, temperatures, 66
pegmatite, theoretical model, 843
porphyry copper, Utah, Bingham, 34
veins, metals, sequence, Peru, 835
Pareek, H. S., *The application of coal petrography to coking property of Indian coals*, 809–821
Parsley, A. J., and Doveton, J. D. H., discussion by, 830
Pathfinders in geochemical prospecting for uranium in New Zealand (Cohen, Brooks, and Reeves), 519–525
Payne, A. L., abstract by, 117
Pegmatite:
exploration, feldspar, evaluation, 938
genesis, theoretical model, 843
India, geochemistry, 66
Pennsylvania:
economic geology, exploration, prospects, classification, 571
zinc, Friedensville, exploration, 351
Percy, G. R., with Sinclair, A. J., *Multiple regression analysis of precious metal values, Phoenix mine, British Columbia, Canada*, 822–824
Permian:
Poland, Zechstein, copper shale, 115
Perry, D. V., *Skarn genesis at the Christmas mine, Gila County, Arizona*, 255–270
Peru:
metals, Julcani, 834, 835
Peters, W. C., abstract by, 116
Petraschek, W. E., discussion by, 576–578
Petrofabrics:
iron ores, New York, Benson mines, 183
methods, X-ray, opaque minerals, 223
Petrography and coking potentiality of Indian coals (Ghosh), 683–690
Petrović, Radomir, and Bachinski, D. J., books received by, 242–243, 361–363, 477, 595–597, 708
Petrović, Radomir, and Barabas, A. H., books received by, 836–840, 947–949
Petrović, Radomir, with Dasch, E. J., and Bachinski, D. J., books received by, 124–127
Phase equilibria:
Ag-Fe-S, argentopyrite, sternbergite, 459
Ca-phosphate-carbonate, natural waters, 365
Fe-S, experimental studies, 405, 420
Fe-S-O, theoretical treatment, 291
Fe-S-O-H, oxidation-reduction reactions, 160
Fe-S-O-Si, experimental studies, 865
K-Al-Si-S-O-H, alunite stability, 599
Mg-Ca-CO_3, dolomite, genesis, 743
pegmatite magma, differentiation, 843
quartz-monzonite, iron, vapor phase, 798
sulfide ores, metamorphism, 118
Philippine Islands:
ore deposits, review, 644
Phosphate:
Egypt, Quseir-Safaga area, 172
Florida, geochemistry, color, 667
geochemistry, marine apatite, genesis, 365
Physical and chemical factors in the formation of marine apatite (Gulbrandsen), 365–382
Pine Point lead-zinc deposits, N.W.T., Canada—introduction and paleoecology of the Presqu'ile reef, The (Jackson and Folinsbee), 711–717
Pine Point, Northwest Territories:
carbon, oxygen, isotopes, 733
formation waters, composition, 385
lead isotopes, 731
paleoecology, Presqu'ile Reef, 711
sulfur isotopes, 718
Piwinskii, A. J., with Martin, R. F., *Experimental data bearing on the movement of iron in an aqueous vapor*, 798–803
Placers:
chromium, Guyana, Merume River, 910
Poland:
Fore-Sudetian, copper shale, 115
geochemistry, Zechstein, 115
zinc, Silesia, 466
Polymetallic ores:
Colorado, Creede, 696
Poole, F. G., with Shawe, D. R., and Brobst, D. A., *Newly discovered bedded barite deposits in East Northumberland Canyon, Nye County, Nevada*, 245–254
Possible relation of mineralization to thermal springs in the Creede district, San Juan Mountains, Colorado (discussion), 696–698
Potash:
exploration, geology, applications, 937
Potash-bearing evaporites—Danakil area (discussion), 228–229
Precambrian:
Michigan, Keweenawan, 342
Principal gold-producing districts in the United States (review), 124
Principles of metallogeny (review), 594
Providencia, Mexico:
fluid inclusions, geochemistry, 629
Pyrih, R. Z., and Bisque, R. E., *Determination of trace mercury in soil and rock media*, 825–828
Pyrite:
genesis, massive sulfide, volcanism, 129
genesis, ore rolls, 160
Queensland, Mount Morgan, 885
Pyrrhotite phase relations below 304 ± 6°C at <1 atm total pressure (Arnold), 405–419

Queensland:
gold, copper, Mount Morgan, 885
Questa, New Mexico:
molybdenum, isotopes, 903

Radioactivity methods:
airborne, evaluation, 933
techniques, ground, evaluation, 50
Radiolaria:
Ordovician, barite rock, Nevada, 245

Radtke, A. S., with Taylor, C. M., *Micromineralogy of silver-bearing sphalerite from Flat River, Missouri*, 306–318
Rafter, T. A., with Both, R. A., Solomon, M., and Jensen, M. L., *Sulfur isotopes and zoning of the Zeehan mineral field, Tasmania*, 618–628
Ragan, D. M., review of book by, 124
Ramović, M., review of book by, 594
Ramsdellite from the Hotazel mine, Northern Cape Province, South Africa (de Waal), 221–223
Rao, S. S., discussion of paper by, 936
Rasnick, F. D., with McCormick, J. E., Evans, L. L., and Palmer, R. A., abstract by, 353
Raymahashay, B. C., and Holland, H. D., *Redox reactions accompanying hydrothermal wall rock alteration*, 291–305
Rb/Sr, S, and O isotopic analyses indicating source and date of contact metasomatic copper deposits, Craigmont, British Columbia, Canada (Chrismas, Baadsgaard, Folinsbee, Fritz, Krouse, and Sasaki), 479–488
Red Sea:
  structural geology, Afar area, 228
Redox reactions accompanying hydrothermal wall rock alteration (Raymahashay and Holland), 291–305
Reefs:
  Northwest Territories, Devonian, Pine Point, 711
  Tennessee, Ordovician, 348
Reeves, R. D., with Cohen, N. E., and Brooks, R. R., *Pathfinders in geochemical prospecting for uranium in New Zealand*, 519–525
Refractive indices of coals carbonized under pressure (Chandra), 338–340
Regional recrystallization and the formation of magnetite concentrations, Dover magnetite district, New Jersey (Collins), 17–33
Rehrig, W. A., with Laughlin, A. W., and Mauger, R. L., *K-Ar chronology and sulfur and strontium isotope ratios at the Questa mine, New Mexico*, 903–909
Relation of zinc-rich formation waters, northern Alberta, to the Pine Point ore deposit (Billings, Kesler, and Jackson), 385–391
Replacement and cockade textures (Rieder), 564–567
Reviews:
  Carbonate sediments and reefs, Yucatan shelf, Mexico (Logan et al.), 476–477
  Development and utilization of mineral resources—a Cento symposium held in Karachi, Pakistan, 1968, 594
  Earth sciences in Canada—a centennial appraisal and forecast, The (Neale, ed.), 242, 594
  Geochemie der Pyrite einiger Lagerstatten der Tschechoslowakei (Gambel and Jarkovský), 595
  Geology of ore deposits (Geologiya rudnykh mestorozhdeniy), Alexandrov, 120–123, 231–242, 354–361, 469–476, 586–594, 701–707, 940–947
  Giacimenti minerari. Vol. 1 (di Colbertaldo), 124
  Guidebook of northern Utah (Jensen, ed.), 708
  Principal gold-producing districts in the United States (Koschman and Bergendahl), 124
  Principles of metallogeny (Ramović), 594
  Shock metamorphism of natural materials (French and Short, eds.), 242
  Soil mechanics (Lee, ed.), 242
  Soils of the world (Papadakis), 594–595
  Structural geology—an introduction to geometrical techniques (Ragan), 124
  Studies of Appalachian geology: northern and maritime (Zen, White, Hadley, and Thompson, eds.), 124
  Tectonic relations of N. Central American and western Caribbean—Bonacca expedition (McBirney, ed.), 476–477
Riddle, Oregon:
  applied geology, 1
Ridge, J. D., abstract by, 117
Rieder, Milan, *Replacement and cockade textures*, 564–567
Robertson, D. K., with Cumming, G. L., *Isotopic composition of lead from the Pine Point deposit*, 731–732
Roedder, Edwin, abstract by, 353; discussion of paper by, 466–468
Role of some statistical and mathematical methods in the interpretation of regional geochemical data, The (Nichol, Garrett, and Webb), 204–220; (discussion), 830
Ruby Creek, Alaska:
  mineral zoning, sulfur isotopes, 75
Runnells, D. D., *The mineralogy and sulfur isotopes of the Ruby Creek copper prospect, Bornite, Alaska*, 75–90
Rye, R. O., and Haffty, Joseph, *Chemical composition of the hydrothermal fluids responsible for the lead-zinc deposits at Providencia, Zacatecas, Mexico*, 629–643

Saager, R., and Esselaar, P. A., *Factor analysis of geochemical data from the Basal Reef, Orange Free State Goldfield, South Africa*, 445–451
Saager, R., with Viljoen, R. P., and Viljoen, M. J., *Metallogenesis and ore control in the Steynsdorp Goldfield, Barberton Mountain Land, South Africa*, 778–797
Sales, R. H., discussion of paper by, 342–346
Salotti, C. A., abstract by, 118
San Manuel:
  hydrothermal alteration, zoning, 118
Sasaki, A., with Chrismas, L., Baadsgaard, H., Folinsbee, R. E., Fritz, P., and Krouse, H. R., *Rb/Sr, S, and O isotopic analyses indicating source and date of contact metasomatic copper deposits, Craigmont, British Columbia, Canada*, 479–488
Sasaki, Akira, and Krouse, H. R., *Sulfur isotopes and the Pine Point lead-zinc mineralization*, 718–730
Sastry, C. A., Murthy, D. S. N., and Krishna Rao, J. S. R., *Origin of iron ores of Kemmangandi, Bababudan Hill ranges of Mysore state, India*, 202–203
Sawkins, F. J., *Chemical brecciation, an unrecognized mechanism for breccia formation?*, 613–617
Schnellman, G. A., reply to discussion by, 695–696
Scientific notes and news, 128, 244, 364, 478, 598, 709, 841, 950
Sea water:
  geochemistry, phosphate, genesis, 365
Sedimentary rocks:
  carbonaceous shale, evolved gases, 919
  carbonate rocks, compaction, Tennessee, Ordovician, 350
  dolomite, genesis, 743
  dolomite, geochemistry, ground water, 349
  ore deposits, barite, Nevada, 245
  phosphate rock, geochemistry, 172, 365
Seismic surveys:
  Eurasia, crustal studies, 693
Serkies, J., with Oberc, J., *Evolution of the Fore-Sudetian copper deposit* (correction, v. 63, no. 4, 372–379), 115
Shawe, D. R., Poole, F. G., and Brobst, D. A., *Newly discovered bedded barite deposits in East Northumberland Canyon, Nye County, Nevada*, 245–254
Sheppard, S. M. F., Nielsen, R. L., and Taylor, H. P., Jr., *Oxygen and hydrogen isotope ratios of clay minerals from porphyry copper deposits*, 755–777
Shock metamorphism of natural materials (review), 242
Short, N. M., with French, B. M., review of book edited by, 242
Sierra Leone:
  geochemical prospecting, 830
  geochemical prospecting, statistical analysis, 204
Silver:
  geochemistry, abundance, sphalerite, 306
  geochemistry, correlations, 822
  geochemistry, system Ag-Fe-S, 459
  ore deposits, general, ore-forming fluids, 95
  Peru, Julcani, mineral zoning, 835
  Utah, East Tintic, absolute age, 915
Simplified statistical treatment of geochemical data by graphical representation, A (Lepeltier), 538–550
Sinclair, A. J., and Percy, G. R., *Multiple regression analysis of precious metal values, Phoenix mine, British Columbia, Canada*, 822–824

Skarn genesis at the Christmas mine, Gila County, Arizona (Perry), 255–270
Society of Economic Geologists:
conference on remobilization of ore and other minerals, 230
Gordon Research Conferences, 1969, 347
meeting, Atlantic City, Nov. 10–12, 1969, program, 831–832; abstracts, 832–835
meeting, Board of Trustees, Society of Economic Geologists Foundation, Inc., Feb. 18, 1969, 699–700
meeting, Denver, Feb. 16–19, 1970, program, 937; abstracts, 937–939
meeting, IMA-IAGOD, Tokyo and Kyoto, Japan, 1970, 116
meeting, Minneapolis 1972, 116, 230
meeting, S.G.A., Vichy, Franch, May 26–31, 1969, French uranium deposits, 699
meeting, Washington, D. C., Feb. 17–20, 1969, abstracts, 116–119
Penrose Medal Award, 831
reports, president, 579–580; secretary, 580–582; treasurer, 582–585; nominating committee, 579
Waldemar Lindgren Citation Award, 1968, 347; 1969, 700
Soil mechanics (review), 242
Soils:
genesis, West Indies, bauxite, 804
geochemistry, uranium, analysis, 50, 933
Soils of the world (review), 594–595
Solomon, M., with Both, R. A., Rafter, T. A., and Jensen, M. L., *Sulfur isotopes and zoning of the Zeehan mineral field, Tasmania*, 618–628
Some stability relations of alunite (Hemley, Hostetler, Gude, and Mountjoy), 599–612
Sorensen, J. M., with Jansen, G. J., and Kearney, R. J., *Ellipsometric determination of optical constants of metals: a contribution to reflectivity standards for ore microscopy*, 325–328
South Africa:
asbestos, general, 936
geochemistry, metals, factor analysis, 445
gold, Steynsdorp Goldfield, 778
mineralogy, ramsdellite, Hotazel mine, 221
South Carolina:
geochemistry, Piedmont, geochemical prospecting, 832
Spears, D. A., with Curtis, C. D., discussion of paper by, 341
Spectroscopy:
absorption, gold, nanogram range, 287
atomic absorption, fluid inclusions, 629
atomic absorption, mercury, 825
electron probe, lead-zinc ore, Missouri, 306
mass, evolved gases, sedimentary rocks, 919
Stability of argentopyrite and sternbergite, The (Czamanske), 459–461
Statistical measures:
economic geology, coefficient of variation, sampling, ore deposits, 834
geochemistry, correlation coefficient, geochemical prospecting, 50
Statistical methods:
economic geology, automatic data processing, 117
economic geology, Bayesian classification functions, 571
economic geology, factor analysis, geochemical data, 445
economic geology, graphical representation, 538
economic geology, multiple regression analysis, 822
economic geology, regression techniques, Tennessee, 353
economic geology, sampling, lateritic deposits, 937
economic geology, sampling error, determination, 568
geochemistry, geochemical prospecting, 204, 830
Stauffer, K. W., *Devonian laterite in Chitral State, West Pakistan*, 452–454
Štemprok, Miroslav, and Šulcek, Zdeněk, *Geochemical profile through an ore-bearing lithium granite*, 392–404
Sterling Hill, New Jersey:
structural interpretation, 833
Steven, T. A., discussion by, 696–698
Stocks:
geochemistry, Czechoslovakia, Li granite, 392
mechanism, Utah, Bingham, 34
Stoiser, L. R., with Wells, J. D., and Elliott, J. E., *Geology and geochemistry of Cortez gold deposit, Nevada*, 526–537
Stow, S. H., *The occurrence of arsenic and the color-causing components in Florida land-pebble phosphate rock*, 667–671
Stringfield, V. T., with LeGrand, H. E., abstract by, 352
Strontium:
isotopes, ratios, New Mexico, Questa, 903
Structural geology:
experimental studies, folded folds, geometry, 117
methods, apparent-dip diagram, 464
methods, petrofabrics, X-ray technique, 223
Structural geology—an introduction to geometrical techniques (review), 124
Studies of Appalachian geology: northern and maritime (review), 124
Stumpfl, E. F., discussion by, 341–342
Sturman, B. D., discussion by, 464–465
Sudbury, Ontario:
nickel irruptive, petrology, 833
Šulcek, Zdeněk, with Štemprok, Miroslav, *Geochemical profile through an ore-bearing lithium granite*, 392–404
Sulfide mineralization in a Broadlands geothermal drill hole, Taupo Volcanic Zone, New Zealand (Browne), 156–159
Sulfide mineralization in the Singhbhum shear zone (discussion), 695–696
Sulfur:
geochemistry, magma, liquid immiscibility, 865
geochemistry, oxidation-reduction reactions, 160
geochemistry, pyrrhotite, phase equilibria, 405, 420
geochemistry, redox reactions, 291
geochemistry, sulfide normative variations, 835
isotopes, fractionation, Tasmania, 618
isotopes, massive sulfide, review, 129
isotopes, ratios, Alaska, 75
isotopes, ratios, British Columbia, 479
isotopes, ratios, coexisting sulfides, 147, 829
isotopes, ratios, New Mexico, Questa, 903
isotopes, ratios, Northwest Territories, Pine Point, 718
isotopes, ratios, prediction, 56, 934, 936
Sulfur isotope fractionation in coexisting sulfides from the Heath Steele B-1 orebody, New Brunswick, Canada (Lusk and Crocket), 147–155
Sulfur isotopes and the Pine Point lead-zinc mineralization (Sasaki and Krouse), 718–730
Sulfur isotopes and zoning of the Zeehan mineral field, Tasmania (Both, Rafter, Solomon, and Jensen), 618–628
Synthesis of framboidal pyrite, The (Berner), 383–384

Tagg, A. R., with Hopkins, D. M., Nelson, C. H., and Wang, F., abstract by, 116
Talapatra, A. K., reply to discussion of paper by, 695–696
Talc:
ore deposits, general, evaluation, 938
Tasmania:
geochemistry, Zeehan, sulfur isotopes, 618
Taylor, C. M., and Radtke, A. S., *Micromineralogy of silver-bearing sphalerite from Flat River, Missouri*, 306–318
Taylor, H. P., Jr., with Sheppard, S. M. F., and Nielsen, R. L., *Oxygen and hydrogen isotope ratios of clay minerals from porphyry copper deposits*, 755–777
Tazieff, H., discussion by, 228–229
Teague, K. H., abstract by, 938
Tectonic relations of N. Central American and western Caribbean—Bonacca expedition (review), 476–477

Tectonics:
cycles, sulfide deposits, classification, 835
rift valleys, Ethiopia, Danakil area, 228
Temperatures of formation of pegmatites of Nellore mica-belt, Andhra Pradesh, India (Babu), 66–71
Tennessee:
copper, Ducktown, 118
geochemistry, Copper Ridge, geochemical prospecting, 832
stratigraphy, Ordovician, paleoaquifers, 349, 350
zinc, 353
zinc, barite, iron, age, 348
zinc, barite, manganese, 352
zinc, exploration, 351
zinc, Flat Gap mine, 350
zinc, fluid inclusions, 353
zinc, general, 349, 351
zinc, host rock, permeability, 350
zinc, Jefferson City, 348
zinc, Mascot-Jefferson City, 353
zinc, paleoaquifers, 352
zinc, temperatures, 109
Tertiary:
Egypt, Bahariya Oases, stratigraphy, 424
United States, southeastern, paleoaquifers, 352
Thermal springs:
California, mercury, 489
Colorado, Creede, ore deposits, 696
New Zealand, gold, silver, abundance, 95
New Zealand, metals, geochemistry, 156
Thermodynamic properties:
bond strengths, sulfides, isotope fractionation, 56, 934, 936
fugacity, Fe-S redox reactions, 291
fugacity, oxygen, system Fe-S-O-Si, 865
general, alunite, stability, 599
general, argentopyrite, sternbergite, 459
general, gold-quartz veins, 112, 575
Thompson, J. B., Jr., with Zen, E-an, White, W. S., and Hadley, J. B., review of book edited by, 124
Tin:
Bolivia, geochemistry, thermometry, 118
geochemistry, lithium granite, 392
Titanium:
Wyoming, Iron Mountain, 834
Towse, D. F., abstract by, 938
Trace metal zonation in a native copper nugget from the McCarthy district, Alaska (Forbes and Barsdate), 455–458
Trace-element analyses:
barite-rock, Nevada, 251
brines, western Canada, 389
fluid inclusions, Mexico, atomic absorption, 632–633
granite, India, 679–680
hornblende rocks, New Jersey, iron deposits, 23, 25, 27
iron ore, India, Mysore, 203
lithium granite, Czechoslovakia, 402
metamorphic rocks, South Africa, 783
native-copper nuggets, Alaska, atomic absorption, 456
ore-forming fluids, thermal springs, New Zealand, 156
phosphate, Florida, arsenic, 668
pyrite, Nevada, Cortez gold deposit, 534
sedimentary rocks, evolved gases, mass spectroscopy, 920
sphalerite-rich lead ore, Missouri, Flat River, 307
stream sediments, Sierra Leone, 212
thermal waters, New Zealand, 97, 98, 104
Tumialan, P. H., with Hagni, R. D., and Masiello, R. A., *Metamorphic aspects of the magnetite-hematite deposit at Benson mines, New York*, 183–190
Tungsten:
geochemistry, lithium granite, 392
Turneaure, F. S., with Kelly, W. C., abstract by, 118

Unconformities:
Tennessee, Ordovician, 348, 349, 350
Unstable sulfur compounds and the origin of roll-type uranium deposits (Granger and Warren), 160–171
Uranium:
exploration, automatic data processing, 117
exploration, geochemical prospecting, 50, 933
geochemistry, ore rolls, 160
New Zealand, Lower Buller Gorge, 519
Ontario, Bancroft, anhydrite ore, 691
South Africa, Witwatersrand, 445
Use of diagram (discussion), 464–465
Utah:
absolute age, Bingham, volcanics, intrusions, 228, 229
absolute age, East Tintic, 915
copper, Bingham, 34

Van Nort, S. D., with Chace, F. M., Cumberlidge, J. T., and Cameron, W. L., *Applied geology at the Nickel Mountain mine, Riddle, Oregon*, 1–16
Veins:
gold-quartz, genesis, 112, 575
Viljoen, R. P., Saager, R., and Viljoen, M. J., *Metallogenesis and ore control in the Steynsdorp Goldfield, Barberton Mountain Land, South Africa*, 778–797
Viljoen, M. J., with Viljoen, R. P., and Saager, R., *Metallogenesis and ore control in the Steynsdorp Goldfield, Barberton Mountain Land, South Africa*, 778–797
Virginia:
zinc, Timberville, exploration, 351
Volcanism:
ore genesis, massive sulfide deposits, 129
Volcanoes:
Europe, Asia, active, atlas, 693

Wagner, R. J., abstract by, 938–939
Walker, A. L., and Buchanan, A. S., *Geochemical processes in ore formation—Pt. I. The production of hydrothermal fluids from sedimentary sequences. Pt. II. Kinetics of high temperature gas phase metal transport and the relation of the model systems to the natural environment*, 919–931
Wall rock alteration at the Boliden deposit, Sweden (Nilsson, correction, v. 63, no. 5, 472–494), 468
Wang, F., with Hopkins, D. M., Nelson, C. H., and Tagg, A. R. abstract by, 116
Warren, C. G., with Granger, H. C., *Unstable sulfur compounds and the origin of roll-type uranium deposits*, 160–171
Warren, H. V., and Delavault, R. E., *Aqua regia extractable copper and zinc in volcanic rocks in relation to copper mineralization*, 672–676
Wayland, T. E., abstract by, 939
Weathering:
ultramafic rock, Oregon, Riddle, nickel, 1
Webb, J. S., with Nichol, Ian, and Garrett, R. G., *The role of some statistical and mathematical methods in the interpretation of regional geochemical data*, 204–220; discussion of paper by, 830
Wedow, Helmuth, Jr., abstract by, 353
Wedow, Helmuth, Jr., with Carpenter, R. H., and Fagan, J. M. abstract by, 348
Wedow, Helmuth, Jr., with Hill, W. T., abstract by, 350–351
Wedow, Helmuth, Jr., with Hill, W. T., and McCormick, J. E., abstract by, 349–350
Weissberg, B. G., *Gold-silver ore-grade precipitates from New Zealand thermal waters*, 95–108
Wells, J. D., Stoiser, L. R., and Elliott, J. E., *Geology and geochemistry of Cortez gold deposit, Nevada*, 526–537
Wertz, J. B., abstract by, 116–117
West Indies:
bauxite, Cayman Islands, 804
White, D. E., discussion of paper by, 696–698
White, W. S., with Zen, E-an, Hadley, J. B., and Thompson, J. B., Jr., review of book edited by, 124
White Pine, Michigan:
rhyolite, age, 342
Whitehead, N. E., and Brooks, R. R., *A comparative evaluation of scintillometric, geochemical, and biogeochemi-*

cal methods of prospecting for uranium, 50–55; discussion of paper by, 933; reply to discussion of paper by, 933–934
Wignall, T. K., *Generalized Bayesian classification functions: K classes*, 571–574
Witwatersrand:
geochemical data, factor analysis, 445
Worthington, J. E., and Kiff, I. T., abstract by, 118
Wyoming:
iron, Iron Mountain, 834

X-ray diffraction analysis:
data, pyrrhotite, 405
methods, petrofabrics, opaque minerals, 223

Yellur, D. D., *Lead-zinc mineralization in the Champaner rocks of Khandia, Baroda district, Gujarat, India*, 677–682
Yund, R. A., and Hall, H. T., *Hexagonal and monoclinic pyrrhotites*, 420–423

Zen, E-an, White, W. S., Hadley, J. B., and Thompson, J. B., Jr., review of book edited by, 124
Zinc:
abundance, volcanics, acid soluble, 672
Alaska, Ruby Creek, occurrence, 75
Appalachians, genesis, theory, history, 351
Appalachians, ore deposits, general, 351
geochemistry, abundance, fluid inclusions, 629
geochemistry, fluid inclusions, 353
geochemistry, sphalerite micromineralogy, 306
India, Gujarat, 677
New Brunswick, Bathurst, 829
New Brunswick, Heath Steele, 147
New Brunswick, Heath Steele, zoning, 509
New Jersey, Sterling Hill, structure, 833
Northwest Territories, Pine Point, 385, 466, 711, 718, 731, 733
Peru, Julcani, mineral zoning, 835
Philippine Islands, ore deposits, general, 644
Tasmania, Zeehan field, 618
Tennessee, age, 348
Tennessee, east, host rock, compaction, 350
Tennessee, east, solution collapse, 353
Tennessee, Flat Gap mine, 350
Tennessee, general, 352
Tennessee, genesis, 349
Tennessee, Jefferson City, 348
Tennessee, Mascot-Jefferson City district, 353
Utah, East Tintic, absolute age, 915

GEOLOGY LIBRARY
SG GUYOT HALL
PRINCETON UNIVERSITY

M

ECONOMIC GEOLOGY

AND THE

BULLETIN OF THE SOCIETY OF ECONOMIC GEOLOGISTS

EDITOR: BRIAN J. SKINNER
Yale University, New Haven, Connecticut

EDITORIAL ASSISTANT: LOUISE W. SCHROEDER

BUSINESS EDITOR: R. V. DIETRICH
Central Michigan University, Mount Pleasant, Michigan

EDITORIAL BOARD

M. L. JENSEN and THOMAS W. MITCHAM
Salt Lake City, Utah

A. J. NALDRETT
Toronto, Ontario

CHARLES F. PARK, JR.
Stanford, California

CHARLES H. SMITH
Ottawa, Canada

RALPH W. MARSDEN
Duluth, Minnesota

WM. C. KELLY
Ann Arbor, Michigan

J. O. KALLIOKOSKI
Houghton, Michigan

FRANK M. VOKES
Trondheim, Norway

RICHARD P. SHELDON
Washington, D. C.

EDITOR EMERITUS: ALAN MARA BATEMAN

BOARD OF ASSOCIATE EDITORS

D. F. HEWETT
U. S. Geological Survey, Menlo Park, Calif.

ARTHUR A. BRANT
Danbury, Connecticut

L. C. GRATON
New Haven, Connecticut

H. C. GUNNING
Vancouver, Canada

KONRAD B. KRAUSKOPF
Stanford University, California

N. H. FISHER
Bureau of Mineral Resources, Canberra, Australia

PER GEIJER
Djursholm, Sweden

P. F. FOURMARIER
Liège University, Liège, Belgium

M. S. KRISHNAN
Osmania University, Hyderabad, India

T. W. GEVERS
University of the Witwatersrand, Johannesburg, S. Africa

TAKEO WATANABE
University of Tokyo, Tokyo, Japan

PAUL RAMDOHR
University of Heidelberg, Heidelberg, Germany

VOLUME 64

NEW HAVEN, CONNECTICUT

THE ECONOMIC GEOLOGY PUBLISHING COMPANY

1969

SOCIETY OF ECONOMIC GEOLOGISTS

THE PUBLICATIONS OF WHICH CONSTITUTE A PART OF THIS JOURNAL

OFFICERS FOR 1969

FREDERICK S. TURNEAURE, *President*
University of Michigan, Ann Arbor, Michigan 48104

EUGENE N. CAMERON, *Vice President*
University of Wisconsin, Madison, Wisconsin 53706

HAROLD L. JAMES, *President-Elect*

ROBERT A. LAURENCE, *Secretary*
P. O. Box 1549, Knoxville, Tennessee 37901

ROBERT M. GROGAN, *Treasurer*
Room 6015, DuPont Building, Wilmington, Delaware 19898

ERNEST L. OHLE, *Vice President-Elect*

Councilors

to March 1970	*to March 1971*	*to March 1972*
F. STUART MILLER	PAUL AVERITT	PAUL C. HENSHAW
VINCENT E. MCKELVEY	SIEGFRIED MUESSIG	RALPH W. MARSDEN
HOMER F. ZURBRIGG	JOHN B. PATTON	OGDEN L. TWETO

President; Vice President; President-Elect; Vice President-Elect; CHARLES A. ANDERSON, *Past President;*
WILLIAM H. CALLAHAN, *Past Vice President; Secretary; Treasurer*

G. L. KROL, *President;* A. BERNARD, *Secretary, Société de Geologie Appliquée aux Gîtes Mineraux*
W. S. WHITE, *President;* B. J. SKINNER, *Editor;* R. V. DIETRICH, *Business Editor, Economic Geology Publishing Company*

Regional Vice Presidents

T. W. GEVERS, Africa
DONALD S. CARRUTHERS, Australia
TAKEO WATANABE, Asia
PIERO ZUFFARDI, Europe
CHARLES H. SMITH, North America
CARLOS F. RUIZ, South America

Executive Committee
President
Vice President
Secretary
Treasurer
President-Elect
Past President
President, Publishing Co.

Finance Committee
F. STUART MILLER, *Chairman*
FRANCIS CAMERON
LYMAN H. HART
GEORGE E. KRUGER
R. M. GROGAN, *ex-officio*

Program Committee
R. M. DREYER, *Chairman*
K. E. RICHARD
S. R. WALLACE

Publications Committee
D. L. EVERHART, W. C. KELLY — *to March 1970*
PAUL B. BARTON, E. L. OHLE — *to March 1971*
V. E. MCKELVEY, PAUL K. SIMS, *Chairman* — *to March 1972*

Nominating Committee
SIEGFRIED MEUSSIG, *Chairman*
V. C. KELLEY
V. D. PERRY

Admissions Committee
NEIL CAMPBELL, *Chairman*
F. J. MARKEWICZ
J. B. PATTON
D. R. SHAWE
R. J. WEEGE

Program Policy Committee
WM. H. CALLAHAN, *Chairman*
EUGENE N. CAMERON
ROBERT M. DREYER
ROBERT E. FOLINSBEE
ERNEST L. OHLE
KENYON RICHARD
BRIAN J. SKINNER
STEWART R. WALLACE
PAUL GERDEMANN

ROBERT A. LAURENCE, *ex-officio*
THOMAS P. THAYER, *ex-officio*

Auditing Committee
H. E. HAWKES, *Chairman*
HAROLD KIRKEMO

Committee on Committees
A. T. BRODERICK, *Chairman*
H. L. BARNES
H. T. MORRIS

Research Committee

to March 1970	*to March 1971*	*to March 1972*
H. L. BARNES	A. A. BRANT	P. A. BAILLY
D. E. FLINT	P. S. HAAPELA	P. S. CLOKE
R. S. CANNON, JR.	T. P. THAYER, *Chairman*	W. E. HALL

Committee on Perpetuation of Society

to March 1970	*to March 1971*	*to March 1972*
JOHN PAYNE, JR.	OLAF N. ROVE, *Chairman*	PRIESTLEY TOULMIN, III

Membership Secretary: CARL E. DUTTON, 222 Science Hall, Madison, Wisconsin 53706

Representative to American Geological Institute

to March 1970	*to March 1972*
VINCENT E. MCKELVEY	JACK A. JAMES

Representative to the A.G.I. Translations Committee: B. F. LEONARD, III
Representative to National Research Council, Division of Earth Sciences: JOHN D. RIDGE
Representative to International Critical Tables of N.R.C.—N.A.S.: EDWIN W. ROEDDER

GEOLOGY LIBRARY
SG GUYOT HALL
PRINCETON UNIVERSITY

CONTENTS OF VOLUME 64

Number 1

Applied Geology at the Nickel Mountain Mine, Riddle, Oregon
F. M. Chace, J. T. Cumberlidge, W. L. Cameron, and S. D. Van Nort 1

Regional Recrystallization and the Formation of Magnetite Concentrations, Dover Magnetite District, New Jersey ..... *Lorence G. Collins* 17

Igneous Rocks and Hydrothermal Alteration at Bingham, Utah ..... *R. Eldon Bray* 34

A Comparative Evaluation of Scintillometric, Geochemical and Biogeochemical Methods of Prospecting for Uranium ..... *Neil E. Whitehead and Robert R. Brooks* 50

Bond Strength and Sulfur Isotopic Fractionation in Coexisting Sulfides ..... *Donald J. Bachinski* 56

Temperatures of Formation of Pegmatites of Nellore Mica-Belt, Andhra Pradesh, India
V. R. R. M. Babu 66

Economic Geology Research ..... *Thomas W. Mitcham* 72

The Mineralogy and Sulfur Isotopes of the Ruby Creek Copper Prospect, Bornite, Alaska
Donald D. Runnells 75

A Note on the Occurrence of Violarite, Copper King Mine, Boulder County, Colorado
William H. Bird 91

Gold-Silver Ore-Grade Precipitates from New Zealand Thermal Waters ..... *B. G. Weissberg* 95

Scientific Communications:

Fluid Inclusion Temperature Measurements in the East Tennessee Zinc District
John David Miller 109

Commission on Ore Microscopy ..... *S. H. U. Bowie* 110

Discussions:

Hydrothermal Transport and Deposition of Gold ..... *R. W. Boyle* 112

Evolution of the Fore-Sudetian Copper Deposit ..... *J. Oberc and J. Serkies* 115

Society of Economic Geologists:

Minneapolis 1972 116

IMA-IAGOD Meetings '70 116

Abstracts of Papers Presented at the Joint Meeting of the Society and the Society of Mining Engineers of AIME in February, 1969 116

Reviews:

Geology of Ore Deposits, Vol. 8, No. 1, 1966 ..... *E. A. Alexandrov* 120

Giacimenti Minerari, Vol. I (Dino di Colbertaldo) 124

Principal Gold Producing Districts in the United States (A. H. Koschman and M. H. Bergendahl) 124

Studies of Appalachian Geology: Northern and Marine (E-an Zen, W. S. White, J. B. Hadley & J. B. Thompson, Jr., Eds.) 124

Structural Geology—An Introduction to Geometrical Techniques (D. M. Ragan) 124

Books Received ..... *E. Julius Dasch, Radomir Petrović, and Donald J. Bachinski* 124

Scientific Notes and News 128

Number 2

Massive Sulfide Deposits and Volcanism ..... *Charles A. Anderson* 129

Sulfur Isotope Fractionation in Coexisting Sulfides from the Heath Steele B-1 Orebody, New Brunswick, Canada ..... *John Lusk and James H. Crocket* 147

Sulfide Mineralization in a Broadlands Geothermal Drill Hole, Taupo Volcanic Zone, New Zealand
P. R. L. Browne 156

Unstable Sulfur Compounds and the Origin of Roll-type Uranium Deposits
H. C. Granger and C. G. Warren 160

Paleogeography, Paleoecology and Genesis of the Phosphatic Sediments in the Quseir-Safaga Area, U. A. R. ..... *El-Sayed El-Tarabili* 172

Metamorphic Aspects of the Magnetite-Hematite Deposit at Benson Mines, New York
Richard D. Hagni, R. A. Masiello, and P. H. Tumialan 183

Host Rock Origin of Magnetite in Pyroxene Skarn and Gneiss and Its Relation to Alaskite and Hornblende Granite ..... *Lorence G. Collins* 191

Origin of Iron Ores of Kemmangandi, Bababudan Hill Ranges of Mysore State India
C. Anjaneya Sastry, D. S. N. Murthy, and J. S. R. Krishna Rao 202

The Role of Some Statistical and Mathematical Methods in the Interpretation of Regional Geochemical Data ..... *Ian Nichol, R. G. Garrett, and J. S. Webb* 204

Scientific Communications:

Ramsdellite from the Hotazel Mine, Northern Cape Province, South Africa ..... *S. A. de Waal* 221

Analysis of Ore Fabric ..... *Ananda K. Chakrabarti* 223

Discussions:

Chronology of Intrusion, Volcanism, and Ore Deposition at Bingham, Utah ..... *James Gilluly* 228

Potash-Bearing Evaporites—Danakil Area ..... *H. Tazieff* 228

Chronology of Intrusion, Volcanism, and Ore Deposition at Bingham, Utah—A Reply
W. J. Moore, M. A. Lanphere, and J. D. Obradovich 229

Society of Economic Geologists:

Conference on Remobilization of Ore and Other Minerals 230

Minneapolis 1972 230

Reviews:

Geology of Ore Deposits, Vol. 8, No. 2, 1966 ..... *E. A. Alexandrov* 231

Geology of Ore Deposits, Vol. 8, No. 3, 1966 ..... *E. A. Alexandrov* 235

Geology of Ore Deposits, Vol. 8, No. 4, 1966 ..... *E. A. Alexandrov* 239

Soil Mechanics (I. K. Lee, Editor) 242

The Earth Sciences in Canada (E. R. W. Neale, Editor) 242

Shock Metamorphism of Natural Materials (B. M. French and N. M. Short, Eds.) 242

Books Received ..... *Radomir Petrović, and Donald J. Bachinski* 242

Scientific Notes and News 244

Number 3

Newly Discovered Bedded Barite Deposits in East Northumberland Canyon, Nye County, Nevada
D. R. Shawe, F. G. Poole, and D. A. Brobst 245

Skarn Genesis at the Christmas Mine, Gila County, Arizona ..... *David V. Perry* 255

The Geology and Genesis of the Bi-Cu Mineralized Breccia-Pipe, San Francisco de los Andes, San Juan, Argentina ..... *Eduardo Jorge Llambías and Lidia Malvicini* 271

Determination of Gold in Waters in the Nanogram Range by Anion Exchange and Atomic Absorption Spectrophotometry ..... *T. T. Chao* 287

Redox Reactions Accompanying Hydrothermal Wall Rock Alteration
Bikash C. Raymahashay and Heinrich D. Holland 291

Micromineralogy of Silver-Bearing Sphalerite from Flat River, Missouri
Charles M. Taylor and Arthur S. Radtke 306

On the Effects of Igneous Intrusion on a Few Coal Seams of the Jharia Coal Field, Bihar, India
Ananda K. Chakrabarti 319

Ellipsometric Determination of Optical Constants of Metals: A. Contribution to Reflectivity Standards for Ore Microscopy ..... *G. J. Jansen, J. M. Sorensen, and R. J. Kearney* 325

Clot Textures Developed in the Chromitites of Nausahi, Keonjhar District, Orissa, India
S. Mukherjee 329

Refractive Indices of Coals Carbonized Under Pressure ..... *D. Chandra* 338

Discussions:

The Formation of Sedimentary Iron Minerals ..... *L. A. Bubenicek* 341

Determining Fineness Variation Characteristics in Gold Ores by Reflectometry .. *E. F. Stumpfl* 341

Age and Genesis of Quartz-Porphyry Near White Pine, Michigan
Elwood R. Brooks and Phillip L. Garbutt 342

Society of Economic Geologists:

Waldemar Lindgren Citation Award, 1968 347

Gordon Research Conferences, 1969 347

Abstracts of Papers Presented at Symposium, University of Tennessee, March 27–29, 1969 .. 348

Reviews:

Geology of Ore Deposits, Vol. 8, No. 5, 1966 ..... *E. A. Alexandrov* 354

Geology of Ore Deposits, Vol. 8, No. 6, 1966 ..... *E. A. Alexandrov* 357

Books Received ..... *Radomir Petrovic and Donald J. Bachinski* 361

Scientific Notes and News 364

CORRECTION 364

Number 4

Physical and Chemical Factors in the Formation of Marine Apatite ..... *R. A. Gulbrandsen* 356

The Synthesis of Framboidal Pyrite ..... *Robert A. Berner* 383

Relation of Zinc-Rich Formation Waters, Northern Alberta, to the Pine Point Ore Deposit
Gale K. Billings, Stephen E. Kesler, and Stewart A. Jackson 385

Geochemical Profile through an Ore-Bearing Lithium Granite
Miroslav Štemprok and Zdeněk Šulcek 392

Pyrrhotite Phase Relations Below 304±6°C at <1 Atm Total Pressure ..... *R. G. Arnold* 405

Hexagonal and Monoclinic Pyrrhotites ..... *R. A. Yund and H. T. Hall* 420

El-Gidida Iron Ores and Their Origin, Bahariya Oases, Western Desert, U. A. R.
Emile Z. Basta and Hamza I. Amer 424

Factor Analysis of Geochemical Data from the Basal Reef, Orange Free State Goldfield, South Africa
R. Saager and P. A. Esselaar 445

Devonian Laterite in Chitral State, West Pakistan ..... *Karl W. Stauffer* 452

Trace Metal Zonation in a Native Copper Nugget from the McCarthy District, Alaska
Robert B. Forbes and Robert J. Barsdate 455

Scientific Communication:

The Stability of Argentopyrite and Sternbergite ..... *Gerald K. Czamanske* 459

Discussions:

Copper Mineralization in the Upper Part of the Copper Harbor Conglomerate at White Pine, Michigan—A Reply ..... *Stanley K. Hamilton* 462

Use of the Diagram ..... *B. D. Sturman* 464

Noncolloidal Origin of Colloform Textures ..... *Czeslaw Harańczyk* 466

Wall Rock Alteration, Boliden, Sweden ..... *C. A. Nilsson* 468

Reviews:

Geology of Ore Deposits, Vol. 9, No. 1, 1967 ..... *E. A. Alexandrov* 469
Geology of Ore Deposits, Vol. 9, No. 2, 1967 ..... *E. A. Alexandrov* 473
Carbonate Sediments and Reefs, Yucatan Shelf, Mexico ..... *B. W. Logan et al* 476
Books Received ..... *Radomir Petrović, and Donald J. Bachinski* 477

Scientific Notes and News 478

Number 5

Rb/Sr, S, and O Isotopic Analyses Indicating Source and Date of Contact Metasomatic Copper Deposits, Craigmont, British Columbia, Canada
L. Chrismas, H. Baadsgaard, R. E. Folinsbee, P. Fritz, H. R. Krouse and A. Sasaki 479

Hydrothermal Alteration and Ore Deposition in Serpentinite-Type Mercury Deposits
F. B. Henderson III 489

Experimental Deformation and Annealing of Sulfides and Interpretation of Ore Textures ..... *J. E. Gill* 500

Base Metal Zoning in the Heath Steele B-1 Orebody, New Brunswick, Canada ..... *John Lusk* 509

Pathfinders in Geochemical Prospecting for Uranium in New Zealand
Noel E. Cohen, Robert R. Brooks and Roger D. Reeves 519

Geology and Geochemistry of the Cortez Gold Deposit, Nevada
John D. Wells, Lee R. Stoiser and James E. Elliott 526

A Simplified Statistical Treatment of Geochemical Data by Graphical Representation
Claude Lepeltier 538

Hydrothermal Alteration of a Breccia Pipe Deposit, Tribag Mine, Batchwana Bay, Ontario
George A. Armbrust 551

Replacement and Cockade Textures ..... *Milan Rieder* 564

Scientific Communications:

The Determination of Sampling and Analytical Errors in Exploration Geochemistry
Robert G. Garrett 568

Instructions for North American Geological Investigation: 1756. By *Nicholas Crisp*
Edited by *Edmund and Dorothy Berkeley* 569

Generalized Bayesian Classification Functions: K Classes ..... *Thomas K. Wignall* 571

Discussions:

Hydrothermal Transport and Deposition of Gold ..... *W. E. Ewers* 575
Ore Metals from the Crust or Mantle ..... *W. E. Petrascheck* 576

Society of Economic Geologists:

Report of the Nominating Committee 579
Report of the President, Society Year 1968 579
Report of the Secretary, Society Year 1968 580
Report of the Treasurer, Fiscal Year 1968 582

Reviews:

Geology of Ore Deposits, Vol. 9, No. 3, 1967 ..... *E. A. Alexandrov* 586
Geology of Ore Deposits, Vol. 9, No. 4, 1967 ..... *E. A. Alexandrov* 590
Development and Utilization of Mineral Resources 594
Principles of Metallogeny (*M. Ramović*) 594
The Earth Sciences in Canada (Edited by *E. R. W. Neale*) 594
Soils of the World (*J. Papadakis*) 594

Geochemie der Pyrite einiger Lagerstätten der Tschechoslowakei (*Bohuslav Gambel and Jan Jarkovský*) ... 595
Books Received ... *Radomir Petrović and Donald J. Bachinski* 595
Scientific Notes and News ... 598

Number 6

Some Stability Relations of Alunite
J. J. Hemley, P. B. Hostetler, A. J. Gude, and W. T. Mountjoy 599
Chemical Brecciation, an Unrecognized Mechanism for Breccia Formation? *Frederick J. Sawkins* 613
Sulfur Isotopes and Zoning of the Zeehan Mineral Field, Tasmania
R. A. Both, T. A. Rafter, M. Solomon, and M. L. Jensen 618
Chemical Composition of the Hydrothermal Fluids Responsible for the Lead-Zinc Deposits at Providencia, Zacatecas, Mexico ... *Robert O. Rye and Joseph Haffty* 629
Ore Deposits of the Philippines—An Introduction to Their Geology ... *Leonid Bryner* 644
The Occurrence of Arsenic and the Color-Causing Components in Florida Land-Pebble Phosphate Rock ... *S. H. Stow* 667
Aqua Regia Extractable Copper and Zinc in Volcanic Rocks in Relation to Copper Mineralization
Harry V. Warren and Robert E. Delavault 672
Lead-Zinc Mineralization in the Champaner Rocks of Khandia, Baroda District, Gujarat, India
D. D. Yellur 677
Petrography and Coking Potentiality of Indian Coals ... *T. K. Ghosh* 683
Scientific Communications:
Anhydrite-Pegmatite Uranium Ore at Bancroft Ontario ... *H. W. Little* 691
An Encyclopedia of the Earth's Interior ... *Yekaterina Milyutina* 693
Discussions:
Sulfide Mineralization in the Singhbhum Shear Zone ... *A. K. Talapatra* 695
Possible Relation of Mineralization to Thermal Springs in the Creede District, San Juan Mountains, Colorado: A Discussion ... *Thomas A. Steven* 696
Society of Economic Geologists:
S.G.A. Meeting on French Uranium Deposits (Vichy, France, 26th–31st May, 1969)
P. Zuffardi, SEG Vice-President for Europe 699
Meeting of the Board of Trustees of the Society of Economic Geologists Foundations, Inc. ... 699
Waldemar Lindgren Citation Award ... 700
Reviews:
Geology of Ore Deposits, Vol. 9, No. 5, 1967 ... *E. A. Alexandrov* 701
Geology of Ore Deposits, Vol. 9, No. 6, 1967 ... *E. A. Alexandrov* 705
Guidebook of Northern Utah (*M. L. Jensen*, Editor) ... 708
Books Received ... *Radomir Petrović, and Donald J. Bachinski* 708
Scientific Notes and News ... 709
Notice ... 710

Number 7

The Pine Point Lead-Zinc Deposits, N.W.T., Canada Introduction and Paleocology of the Presqu'ile Reef ... *S. A. Jackson and R. E. Folinsbee* 711
Sulfur Isotopes and the Pine Point Lead-Zinc Mineralization ... *Akira Sasaki and H. Roy Krouse* 718
Isotopic Composition of Lead from the Pine Point Deposit ... *G. L. Cumming and D. K. Robertson* 731

The Oxygen and Carbon Isotopic Composition of Carbonates from the Pine Point Lead-Zinc Ore Deposits ..... *Peter Fritz* 733
The Origin of Hydrothermal and Low Temperature Dolomite ..... *T. S. Lovering* 743
Oxygen and Hydrogen Isotope Ratios of Clay Minerals from Porphyry Copper Deposits *Simon M. F. Sheppard, Bichard L. Nielsen, and Hugh P. Taylor, Jr.* 755
Metallogenesis and Ore Control in the Steynsdorp Goldfield, Barbeton Mountain Land, South Africa *R. P. Viljoen, R. Saager, and M. J. Viljoen* 778
Experimental Data Bearing on the Movement of Iron in an Aqueous Vapor *R. F. Martin and A. J. Piwinskii* 798
Occurrence of Aluminous Lateritic Soils (Bauxites) in the Bahamas and Cayman Islands *N. Ahmad and Robert L. Jones* 804
The Application of Coal Petrography to Coking Property of Indian Coals ..... *H. S. Pareek* 809
Multiple Regression Analysis of Precious Metal Values, Phoenix Mine, British Columbia, Canada *A. J. Sinclair and G. R. Percy* 822

Scientific Communication:

Determination of Trace Mercury in Soil and Rock Media *Roman Z. Pyrih and Ramon E. Bisque* 825

Discussions:

Further Remarks on the Origin of Massive Sulfide Deposits ..... *R. W. Boyle* 829
The Role of Some Statistical and Mathematical Methods in the Interpretation of Regional Geochemical Data ..... *A. J. Parsley and J. D. H. Doveton* 830

Society of Economic Geologists:

Penrose Medal, 1970 831
Atlantic City Meeting, November 10–12, 1969 831

Reviews:

Books Received ..... *Radomir Petrović, and Arthur H. Barabas* 836

Scientific Notes and News 841

Number 8

Experimental Studies of Pegmatite Genesis: I. A Model for the Derivation and Crystallization of Granitic Pegmatites ..... *Richard H. Jahns and C. Wayne Burnham* 843
Liquidus Phase Relations in the FeS-FeO-Fe_3O_4-SiO_2 System and their Application in Geology *Wallace H. MacLean* 865
The Mount Morgan Mine, Queensland—A Massive Gold-Copper Pyritic Replacement Deposit *K. D. Cornelius* 885
K-Ar Chronology and Sulfur and Strontium Isotope Ratios at the Questa Mine, New Mexico *A. W. Laughlin, W. A. Rehrig, and R. L. Mauger* 903
Merumite Occurrence in Guyana ..... *Charles Milton and Sat Narain* 910
Age of Some Tertiary Igneous Rocks from the East Tintic District, Utah *A. W. Laughlin, T. S. Lovering, and R. L. Mauger* 915
Geochemical Processes in Ore Formation
Pt. I. The Production of Hydrothermal Fluids from Sedimentary Sequences 919
Pt. II. Kinetics of High Temperature Gas Phase Metal Transport and the Relation of the Model Systems to the Natural Environment ..... *Alan L. Walker and A. S. Buchanan* 923

Scientific Communication:

Jordanite at Balmat, New York ..... *Peter Lessing* 932

Discussions:

733 A Comparative Evaluation of Scintillometric, Geochemical and Biogeochemical Methods of
743 Prospecting for Uranium ..... *S. H. U. Bowie and D. Ostle* 933

A Comparative Evaluation of Scintillometric, Geochemical and Biogeochemical Methods of
755 Prospecting for Uranium—A Reply ..... *R. R. Brooks and N. E. Whitehead* 933

Bond Strength and Sulfur Isotopic Fractionation in Coexisting Sulfides ..... *E. H. Nickel* 934

778 Bond Strength and Sulfur Isotopic Fractionation in Coexisting Sulfides—A Reply
Donald J. Bachinski 936

798 Origin of Asbestos Deposits of Cuddapah Belt, Andhra Pradesh ..... *D. H. Laubscher* 936

804 *Society of Economic Geologists:*

809 Denver Meeting—February 16–19, 1970 937

822 *Reviews:*

Geology of Ore Deposits, Vol. 10, No. 1, 1968 ..... *E. A. Alexandrov* 940

Geology of Ore Deposits, Vol. 10, No. 2, 1968 ..... *E. A. Alexandrov* 944

825 Books Received ..... *Radomir Petrović and Arthur H. Barabus* 947

Scientific Notes and News 950

829 Index, Volume 64 ..... *Wilna B. Wright* 951

830 Contents, Volume 64 iii

831
831

836

841

843

865

885

903
910

915

919

923

932